

MACHINE AND TOOL
ENGINEERING

MARCH, 1943

The **TOOL ENGINEER**

Official Publication of
American Society of Tool Engineers

Let's Go Fishing?



● Our fighting fronts are geared to our home front, where thousands of NEW BRITAIN AUTOMATICS stand ready to make every minute count, making it possible for our boys to keep on firing.

Industrial absentees slow down the production of automatic machine tools, and by the same token slow down the firing on the fighting fronts. Stay on the job, it's vital. It's no time to fish.



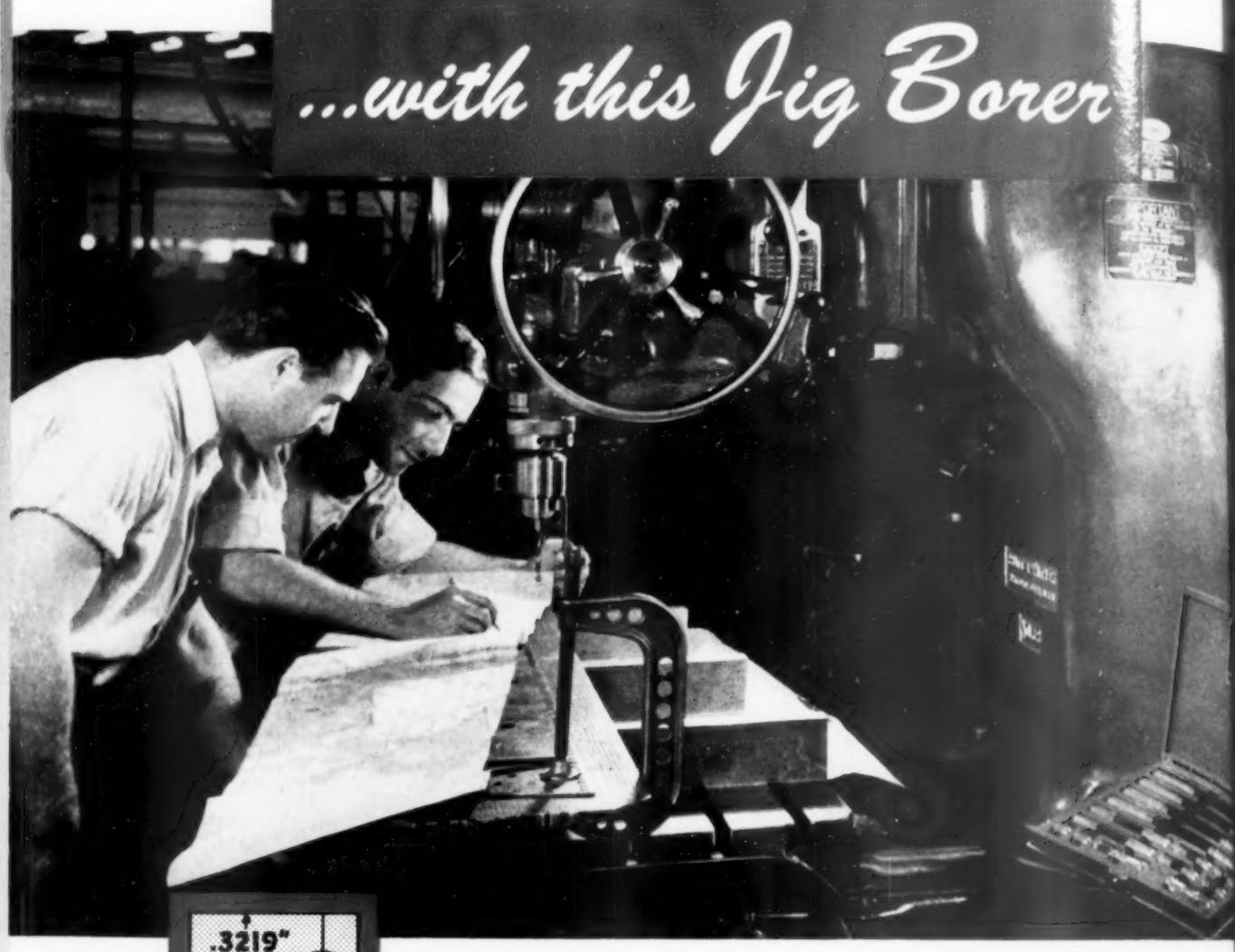
NEW BRITAIN AUTOMATICS

* GET MORE DONE IN WAR OR PEACE *
NEW BRITAIN-GRIDLEY - MACHINE DIVISION
THE NEW BRITAIN MACHINE CO. - NEW BRITAIN, CONNECTICUT

PUBLISHED BY THE BRAMSON PUBLISHING COMPANY

You could bore at any one
of 100 million points in a square inch

...with this Jig Borer



To make sure you have available all the precision you *do* want, Pratt & Whitney builds into this jig borer a degree of accuracy you'll probably seldom need.

Let's say you're making a jig, and want to bore a hole at a known point. With the P&W Jig Borer, you *could* work to four decimal places . . . take your choice of 100 million points in any square inch . . . not just on paper, but *right in the cold metal itself* . . . if you control such variables as temperature and tool wear.

The P&W Jig Borer is one of many Pratt & Whitney products that provide *basic accuracy for mass production*. It can split the linear inch into 10,000 equal parts. It locates, bores, and then checks its own work. From the operator's standpoint, the most important guarantee of accuracy is the pair of dial indicators; once zeroed to a given position, these show at a glance any change from original setting . . . at any stage of the job. Results: speed, precision, less spoilage.

You may seldom work to the last "tenth." But for sure, dependable *basic accuracy* under all working conditions you'll be wise to invest in this *real* jig borer that imposes no limit on your precision.

Call on Pratt & Whitney. Details of P&W Jig Borers will be supplied on request.



PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD • CONNECTICUT

VISIT OUR BOOTH NOS. 7 and 8 AT MACHINE & TOOL PROGRESS EXHIBITION — MILWAUKEE, WISCONSIN, MARCH 25 - 27TH

STANDARD

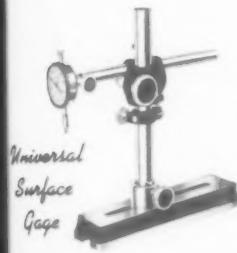
Gages



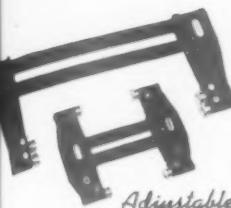
Dial Bore
Gage



Snap Gage



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Gage



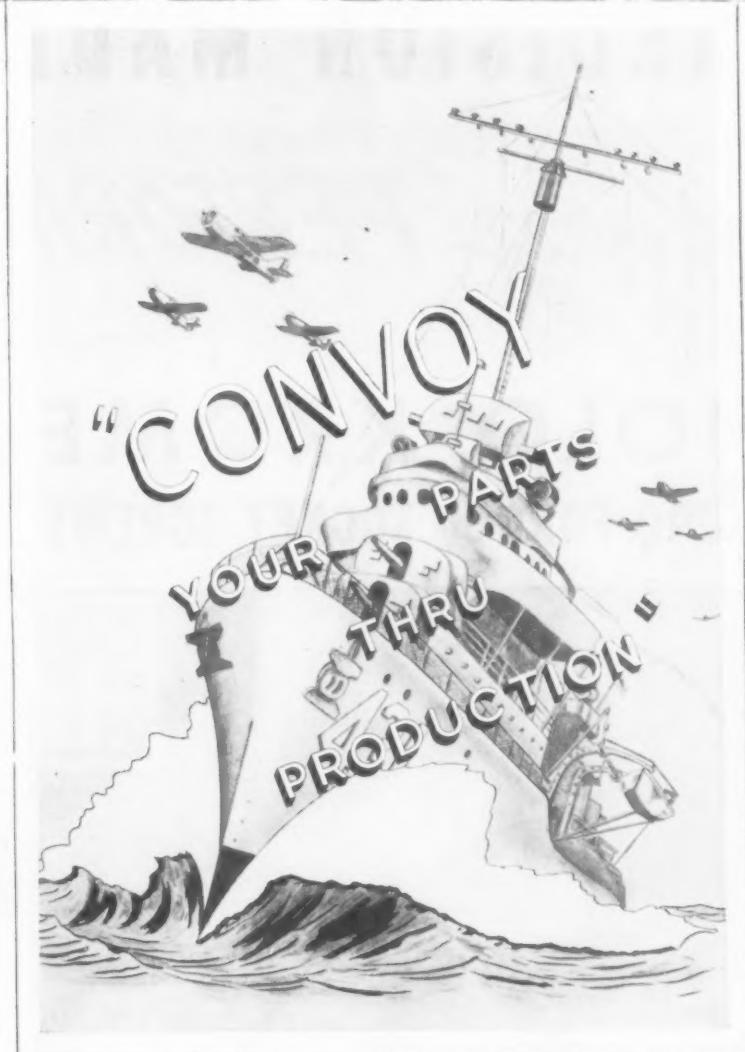
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Dial
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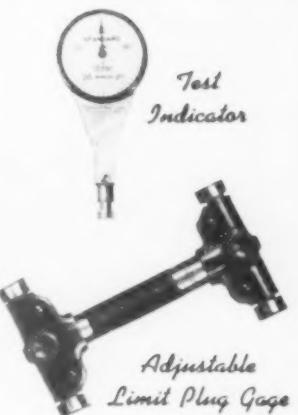
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Cylindrical
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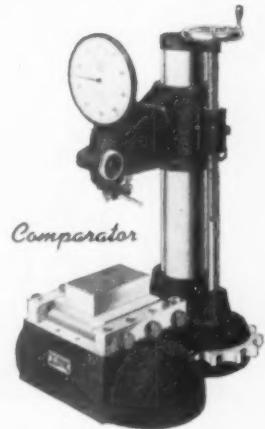
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Dial Pin
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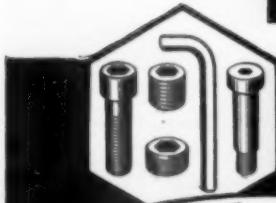
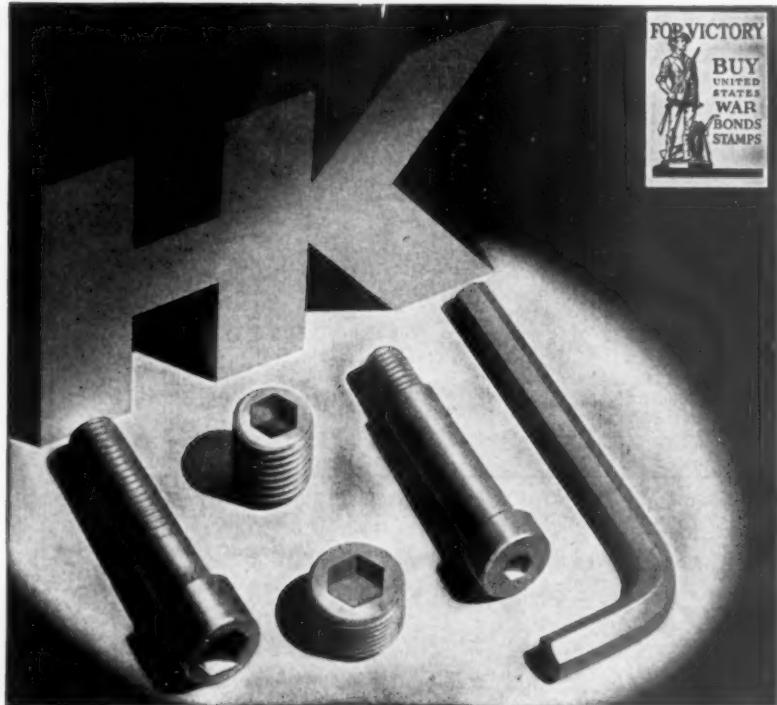
STANDARD GAGE CO., INC. — Poughkeepsie, N.Y.

Completely Cold Forged

PRECISION MADE

GUARANTEED
Unfailing PERFORMANCE

HOLO-KROME
FIBRO FORGED SOCKET SCREWS



HOLO-KROME
fibro forged SOCKET SCREWS

THE HOLO-KROME SCREW CORP. HARTFORD, CONN., U.S.A.

The TOOL ENGINEER

VOL. XII

T.M. REG. U.S. PAT. OFF.
ROY T. BRAMSON

No. 3

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Business Manager

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Circulation Manager

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MARCH, 1943.

BREVITY AND POINTEDNESS

MUCH tooling is still to be done, more than many mass production men realize. However, a growing problem is to cut costs as they relate to labor and machine time. On page 67, Al Conn's "Economics of Tool Engineering" outlines the production executive's job in gaging machine and tooling costs. It will help younger men challenged by rapid promotion.

Brevity and pointedness of Conn's two-pager is typical of the pace set by THE TOOL ENGINEER. To help war production engineers put the magazine to work with maximum efficiency, articles are short and punchy. Even the 10-page Willow Run story is built for quick reading. Whatever your interests, we think you will find that you can take what you want quickly from the short features on each page of this article.

Andy Rylander's turret lathe adaptation and Kearney & Trecker's tool standardization can benefit most shops. "Tool Standardization" incorporates not only standard angles, but standard multiple tool set-ups.

Associate Editor Wally Scotten wrote one of those letters home that tempt us to print the letter and throw the story away. He's been gathering facts on Bell Aircraft in Buffalo. Actually, the letter and the story of lunch with Larry Bell, must be held for after the war. But you'll soon get an approved story on the straight line assembly which is probably the only one in the industry. On the Niagara frontier, Scotten also saw the Pratt & Whitney engine job at the converted Chevrolet plants. He and another writer were first to crack Chev's story since before war production. It's coming.

That evening, Scotten, with GM plant executives, heard Alfred Sloan predict a doubled post-war market. Shop men told Sloan how new tools, materials and techniques, discovered in war production, would meet market demands and drastically reduce costs.

Circulation is fixed as of January 1. But we hear more about second hand readership of THE TOOL ENGINEER. Copies are really going the rounds, and we'll promise to furnish paper that will stand the gaff. The stuff this issue is printed on isn't pretty. We have always insisted that ours was a practical magazine, and that paper that was white and opaque, and tough enough to take a lot of thumbing served readers well. Anything heavier just made it difficult to carry around. But if last year's magazine had been printed on heavier, "arty" stock, we could use heavier paper today. Our quota is based on a percentage of what we used in 1942.

Our job now is to save paper and still pack the magazine with articles that readers tell us they want. We forgot to tell you last month that Greenie would take less space. She says its OK with her. Less posing for the artist means more time on the big job. When 48-hour talk started—Greenie was working 60—she said that was her cue to do that much more. About "Greenies" the country over, our editors say that the gals are in there pitching.



THIS ABOVE ALL*

To liquidate the Hun, to vanquish the armed minions of the Rising (?) Sun, to achieve the spiritual ideals of Democracy—these objectives require a potent **Something**, too fine, too big to be confined within the boundaries of human selfishness.

SELFLESSNESS seems to be the word that best expresses it. Impossible? Perhaps. But here at the Gairing Plant we at least have reason to believe we are on the way toward attaining it.

The skilled craftsmen who man our plant, office staff, salesmen, engineers, management—**WORKERS ALL**—devote from 10 to 35 per cent of their pay checks to the purchase of War Bonds. Here, all are bent on backing our brave fighters by producing the finest metal cutting tools in the greatest possible volume—and investing all our loose dollars in the Bonds that make Victory possible.

THE GAIRING TOOL COMPANY, Detroit, Michigan

**This above all: To thine own self be true
And it must follow as the night the day
Thou canst not then be false to any man.*

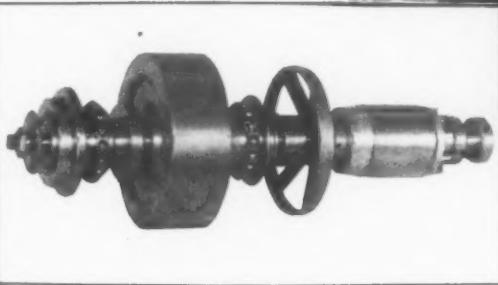
—SHAKESPEARE, Hamlet

GAIRING
FOR OVER A
QUARTER CENTURY
SPECIALISTS
IN FINE
CUTTING TOOLS

Manufacturers of Standard,
Special and Gair-Lock
Inserted Blade Cutting Tools

THE MILWAUKEE FACE MILL GRINDER GIVES YOU ALL THREE!

- ① UNUSUAL RIGIDITY
- ② REDUCED SHARPENING TIME
- ③ ACCURACY TO WITHIN .0002



The three-bearing spindle rotates at 3,400 R.P.M. and carries a heavy flywheel, the inertia of which when in motion successfully keeps the abrasive wheel up to grinding speed. Sharpening time has been considerably reduced as a result.

THE basic design of the Milwaukee Face Mill Grinder embodies strength, precision, and capacity. It is capable of sharpening Tungsten Carbide Cutters ranging from 3" to 16" in diameter — grinds the blades to within .0002.

Set-ups are quickly made with graduated dials, facilitating adjustments. Other controls are handily located for simplified operation.

OTHER IMPORTANT FEATURES:

- 1. Jeweled bearing dial indicator for accurate checking.
- 2. Finger tip control.
- 3. Fine thread precision saddle screw.
- 4. Hand screw permits angular setting of 15° on either side.
- 5. No adapters necessary.
- 6. Spindle has No. 50 National Standard Taper.
- 7. Blower system at slight extra cost.

For complete information write for Bulletin No. 41A

Buy Victory with at least 10% in War Bonds!

Kearney & Trecker
Products
CORPORATION
MILWAUKEE, WISCONSIN
Subsidiary of Kearney & Trecker Corporation

Rotary Head Milling Machine



Automatic Jig Boring Machine



Milwaukee Midgetmill



Milwaukee Speedmill



Milwaukee Face Mill Grinder



Center Scope



HERE'S WHY I CAN SET UP A JOB Faster ON THE GREENLEE SCREW MACHINE!



NO CAMS FOR END-WORKING SLIDE

No valuable time wasted changing tool-side cams on the Greenlee. The end-working tool slide is operated by an intermittent-gear-and-rack mechanism. The working position of the forward stroke is controlled by an adjustable dog on the worm wheel. Setting the tool slide stroke is simply a matter of setting the dog to the selected stroke. A pointer is provided on the dog, and graduations for the various stroke lengths are on the worm wheel to facilitate the setting.



END-WORKING TOOLS EASILY SET UP

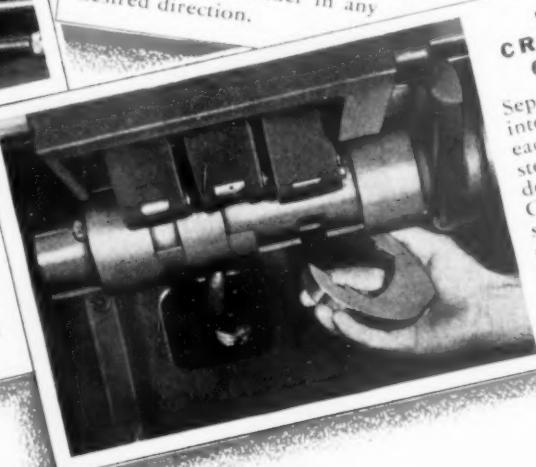
The sturdy end-working tool slide has a broad base with 7 T-slots in as many different surfaces for mounting end-working tools. The tool-holders are fastened in place by T-bolts and tongues which fit accurately in the T-slots, making a simple, rigid connection.

★ More production time on a job is probably lost in downtime for setting up and changing over than for any other single reason. But setting up a job on the Greenlee is such an easy, simple matter that very little production time is lost. Here are just a few of the reasons why setting up is so much easier and faster on the Greenlee.



QUICK, EASY CROSS-SLIDE TOOL ADJUSTMENT

Changing and adjusting cross-slide tools on the Greenlee is simple and easy. After loosening the tool-holder clamp, the operator makes the final, precise adjustments by turning the three fine-thread screws at the rear of the slide, which moves the tool-holder in any desired direction.



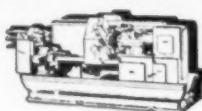
SIMPLE CROSS-SLIDE CAMMING

Separate cams, quickly interchangeable, move each heavy, forged-steel cross slide independently on the Greenlee. These small, compact cams, easily removed, save set-up time and eliminate special camming for each job.

GREENLEE BROS. & CO.

1943 MASON AVENUE

ASK THE OPERATOR



ROCKFORD, ILLINOIS

WHO RUNS ONE . . .



* Neglecting machine tool lubrication is a sure-fire way to get more scrap. Double-check your lubricating practice now. It will pay dividends in many ways.

• WHAT oil should be used in hydraulic systems? How often should oil be changed in gear heads? How can you be sure lubricating schedules are strictly followed? Dozens of questions like these make up the problem of machine tool lubrication. Whether you get the right or wrong answers means the difference between full, useful machine tool life, and breakdowns and scrapped tools.

Periodic checking of the lubricants, application, and lubricating schedules is the only way to be sure you're safe. Longer

hours of operation require more frequent lubrication and oil changes. New machines may require lubricants not previously used in your plant.

Questions like these can be answered quickly and fully by a Standard Lubrication Engineer. These Engineers are available to all plants producing war materials in the Middle West. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Ill., for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

Dirt, chips and water contaminate lubricants, and necessitate regular machine tool lubrication. On machine at left, ways and guides are amply protected from abrasive chips and cutting fluids. Ways, gears, and bearings are automatically lubricated by circulating systems. But all machine tools are not so modern. On those, the lubricants and lubricating schedules, and the help of a Standard Lubrication Engineer in determining them, become increasingly important.



What oil to use? A difficult question to answer for old or rebuilt machines. Wear changes lubricating requirements. Gear heads, for example, may need heavier oils to prevent leakage, or more stable oils to reduce deposits and gear case cleaning. Spindles and bearings may need dripless oils to prevent leakage.

On new equipment, it is frequently necessary to substitute multiple-duty oils in place of those recommended, to avoid stocking a confusing number of lubricants. These must be carefully selected. A Standard Lubrication Engineer's knowledge of lubricants and his experience in other plants enable him to select lubricants exactly fitted to your new equipment.

When to change oil? Each type of machine and its oil system require special consideration, but certain conditions, common to all, help determine when to change oil. For example: type of operation—continuous or intermittent, hours or number of shifts; quality of lubricant; contaminants; age and condition of equipment; efficiency of oil filters, if used; size of oil reservoir.

It's vitally important that the oil stay clean and free from deposits. That should be the first consideration in determining oil change periods—not only to prevent wear, but also to eliminate the time-consuming job of cleaning oil systems.

How to maintain lubricating schedules? With hand-lubricated equipment, there is danger from over-lubrication, as well as neglect. Both can be avoided by being doubly sure that new men, and men taking over equipment new to them, fully understand what lubricants are needed, where they go, and how often they should be applied. One method is to provide cards containing this information to be hung on or near each machine. This eliminates the possibility that operators will forget or misunderstand instructions. A Standard Oil Engineer is familiar with the various methods in use in other plants. His suggestions may help you in starting such a plan.

OIL IS AMMUNITION...
USE IT WISELY

STANDARD OIL COMPANY (INDIANA)



RAPID MACHINING

with *Precision*

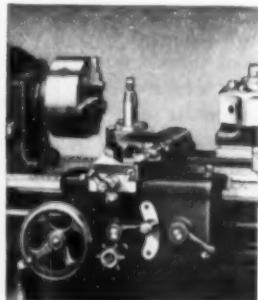
on South Bend Series 1000

TURRET LATHES



RAPID machining *with precision* is easily accomplished in shops that are equipped with the new South Bend Series 1000 Turret Lathes. Designed for manufacturing small accurate parts, they have the stamina to maintain exact tolerances on volume production without sacrificing speed or versatility.

These Turret Lathes are especially suitable for second operation work. The basic South Bend features that insure efficient production are supplemented by the handlever operation of the turret, cross slide, and collet attachment to speed up machine operation and lessen operator fatigue.

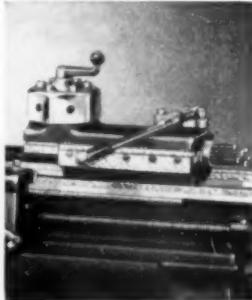


★

UNIVERSAL CARRIAGE

Provides wide variety of feeds for efficient production work — 48 power longitudinal feeds — 48 power cross feeds — 48 precision thread cutting feeds, 4 to 224 per inch.

★



★

HANDLEVER TURRET

Permits rapid positioning of turret tools. Turret indexes automatically on the return stroke. Equipped with adjustable stop for travel of each of the six tool positions.

★

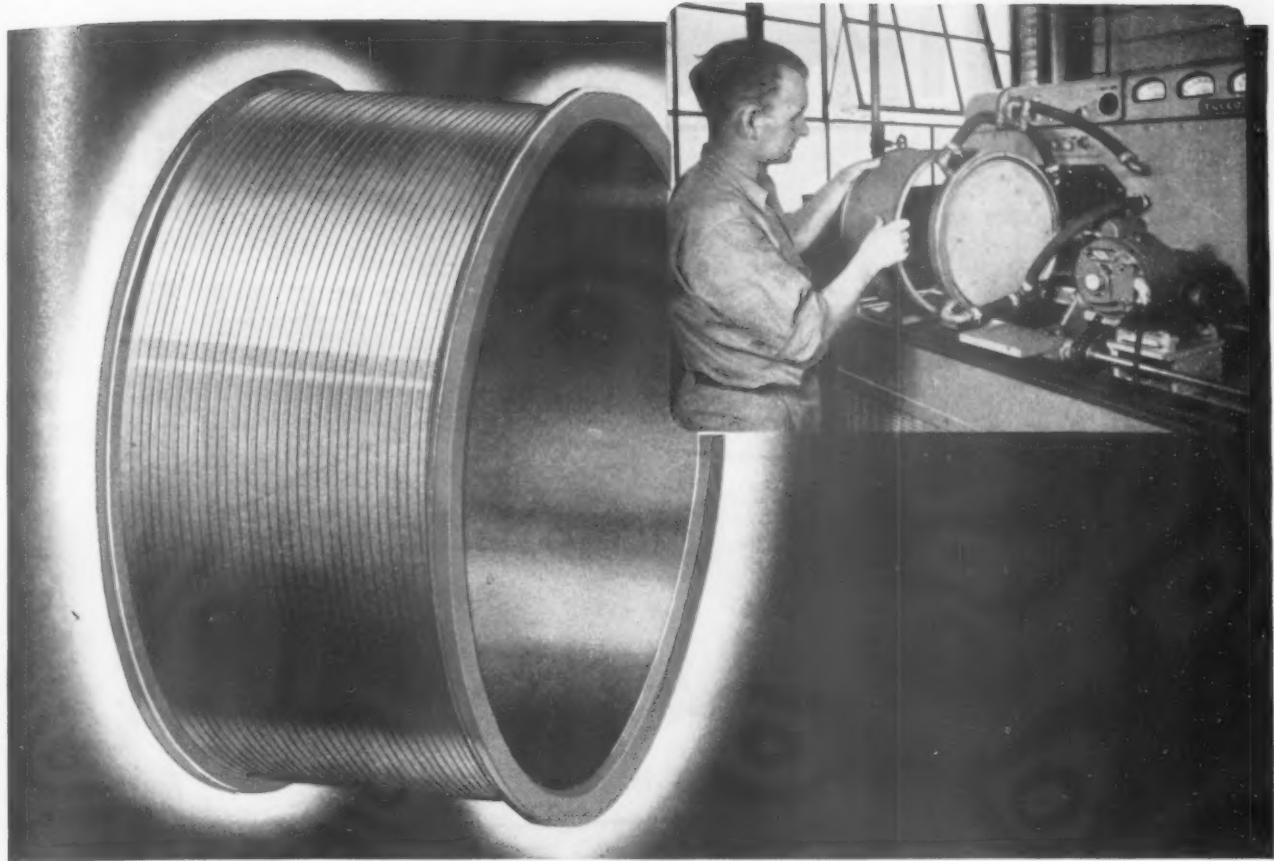
SPECIFICATIONS

Hole through spindle	13
Collet capacity, round	1
Swing over bed and saddle wings	108
Spindle speeds, (twelve)	50 to 1357 r.p.m.
Effective feed of turret slide	
Thread cutting range, (48 threads)	4 to 224 per inch



SOUTH BEND LATHE WORKS
SOUTH BEND, INDIANA

LATHE BUILDERS FOR 36 YEARS



HARDENED AND DRAWN BY TOCCO IN 90 SECONDS

Typical of TOCCO's speed-up of war production is its heat-treatment of 21-inch tank bogey wheels. Here is the split-second time for hardening and drawing a rim—all in one operation—from the moment of pressing the "start" button:

Time to heat to 1600° F. . . . 17.5 sec.

Time to quench 14.0 "

Time to draw 13.5 "

Total time per rim 45.0 sec.

Total TOCCO-treating time for both rims

is only 90 seconds! This speedy, uniform hardening and drawing, localized at the wearing surfaces, has eliminated rejects due to cracking and has materially increased production output. Hardness of rims as drawn (S. A. E. 1335 steel) is 285-381 Brinell.

Find out how TOCCO electrical induction can speed-up and improve your war production. The same standard TOCCO machine, with a simple change of work fixture, can be adapted to the low-cost hardening, annealing, brazing or heating of peacetime products.

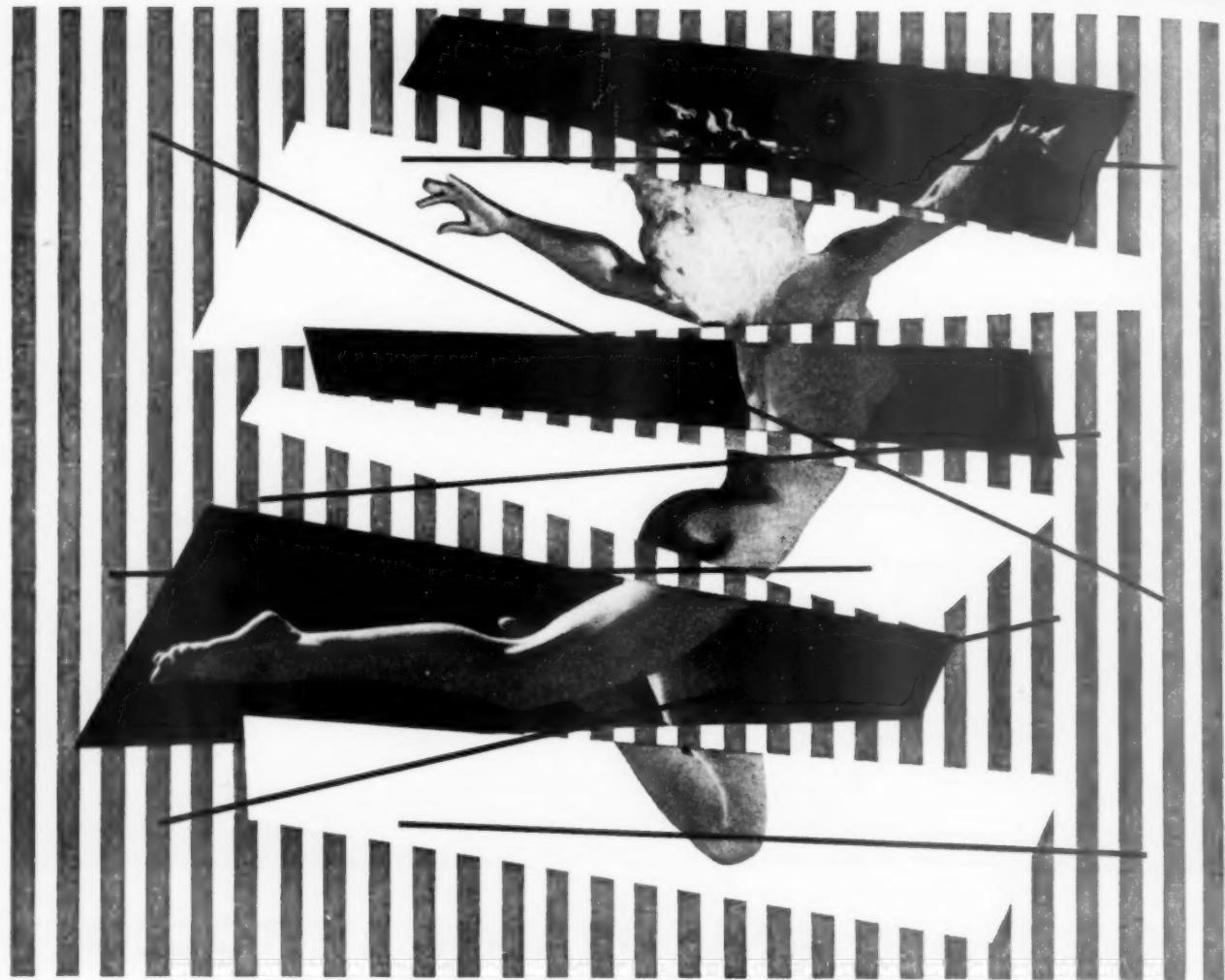
THE OHIO CRANKSHAFT COMPANY
Cleveland, Ohio



TOCCO

World's Fastest, Most Accurate Heat-Treating Process

HARDENING
ANNEALING
BRAZING
HEATING for
forming and forging



This machine can be improved!

THE HUMAN BODY, we've all been told, is the most perfect machine ever devised. Poets, doctors and engineers all agree on this point.

Yet even the human body is capable of change and improvement. Take life expectancy, for example. Less than 100 years ago it was 35 years...today, it is 63.3! And our soldiers today are 2 inches taller and 14 lbs. heavier than they were during the last war.

The important thing about these figures is this: No matter how highly developed a machine may be...no matter how miraculous its accomplishments may seem, **never** make the mistake of assuming it cannot be

improved. Mistakes like this have caused the failure of more than one flourishing business!

The machine tool industry is busy today making machines to make the 45,000 parts of bombing planes, 40,000 parts for tanks, and the multiple parts and instruments for ships, cannon, rifles, torpedoes and shells. And as a result of wartime experience, even such highly developed machines as Cone Multiple Spindle Automatic Lathes will surely be improved.

Cone Automatics are now being used to help build instruments of war. But in the peace to come, they will again be dedicated to building a better, brighter world.

ONE Automatic Machine Company, Inc., Windsor, Vermont



THE TOOL ENGINEER

ANNOUNCING

THE NEW VAN NORMAN INDUCTION HEATING UNITS



Designed and engineered by specialists in induction heating, the new Van Norman high frequency Induction Heating Units . . . 16 KW and 32 KW . . . meet the average requirements for surface hardening, brazing, soldering, and other heating applications in every plant, both large and small.

By localizing heat to a specific portion of the workpiece, Van Norman Induction Heating units cut the heating time to seconds. In addition, they minimize distortion and warping often encountered by other methods of heating and leave the work practically free from scale. The heating time and quenching are controlled accurately and automatically to a fraction of a second and part after part can be processed with identical characteristics.

Write, on company letterhead, for your copy of the new Van Norman Induction Heating bulletin.

Van Norman Machine Tool Co.



Springfield, Mass.

IT PAYS TO "VAN NORMANIZE"

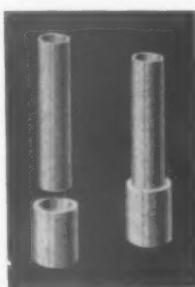
**Easy to Operate
Positive Results
Uniform Hardening
Saves Time
Increases Output
Reduces Costs
Conserves Alloy Steels
Reduces Spoilage
Unlimited Applications**



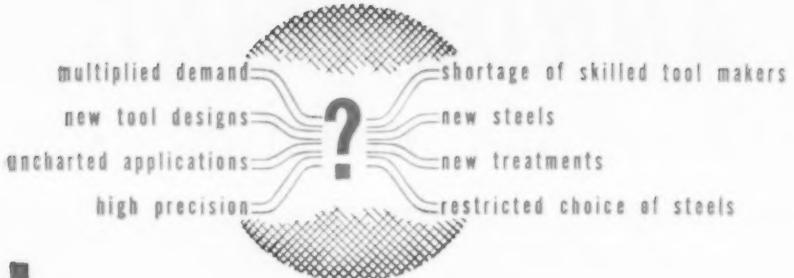
For surface hardening flat surfaces, a flat type of heating coil is used. Heating pattern as revealed by tooth surfaces closely follows contour of teeth. Teeth of part shown are hardened in 13 seconds.



High or low temperature brazing is readily performed on Van Norman units. Illustration shows carbide tip brazed to mild steel tool shank. Operation is completed in a few seconds.



A typical soldering application performed with induction heating. Irregular as well as regular parts are easily soldered. The finished unit has little or no discoloration or scale, thus minimizing cleaning work.



Aid on wartime tool steel problems

Top speed war production demands TOOLS — *more tools than dreamed of in peace time* — *new kinds of tools* for new war time jobs. The tool industry is tackling this tremendous task short of skilled tool makers and restricted by shortages in their choice of steels.

Solutions to these new problems are being worked out every day by the tool industry. Frankly, we don't have all the answers but our contacts with American tool makers determined to win this war puts us in a position to assist you in finding solutions to some of the particular problems that may be facing you.

On your problems of steel selection and treatment of tool steels, we would be very glad to have you get in touch with us. For your convenience, we are listing below the addresses of our district offices.

COPPERWELD STEEL COMPANY • WARREN, OHIO



BUFFALO	1127 Liberty Bank Building	Washington 7283
CHICAGO	122 S. Michigan Avenue	Harrison 1411
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DETROIT	7-251 General Motors Building	Trinity 1-1760
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TO BUILD - - MORE - - BETTER - - FASTER



IN THE AIRCRAFT AS IN OTHER INDUSTRIES

EX-CELL-O

Machine Tools Bring Speed and Accuracy to War Production!

TAKE aircraft engines, for instance. Since fateful December 7, 1941, U. S. aircraft engine production has increased, by horsepower, approximately 240%—actually, in dollar value, there is now more aircraft engine horsepower being delivered every 14 days by American industry than during the whole of World War I. In the turning out of these aircraft engines, Ex-Cell-O is a definite factor. Not only has Ex-Cell-O one of the country's largest precision aircraft parts divisions, but Ex-Cell-O precision machine tools are being used extensively throughout the aircraft industry to produce the many thousands of precision parts needed for aircraft engines. These parts must have a high degree of precision and finish . . . rigid specifications must invariably be observed . . . the parts must be produced as fast as possible. This is the reason why Ex-Cell-O precision machine tools are preferred by managements and workers for the production of these vital parts.

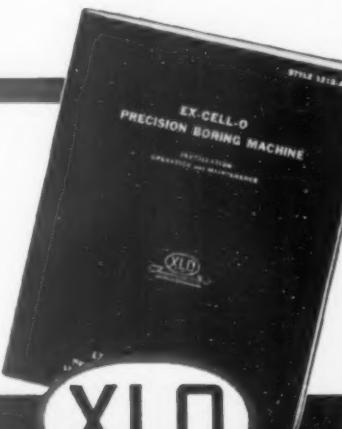
EX-CELL-O CORPORATION • DETROIT



Illustration shows fixture developed by Ex-Cell-O for use in facing both sides of flange and in turning hub diameter on each side, the fixture being operated by a hydraulic cylinder connected to the machine circuit. It carries four tungsten carbide tools that are synchronized mechanically and have individual micro-adjustment in two directions. The two tools nearer the operator turn the hubs and the two at the rear of the fixture face the flange at the same time. All four tools reach the end of their cut simultaneously. Thus, at the intersection of hub O.D. and flange face, each tool is relieved of a plunge cut by the tool on the opposite side. This feature eliminated considerable tool breakage. Former method for machining this aircraft part required three set-ups and production was just one-third of that attained in the one set-up shown above.
MACHINE: Ex-Cell-O 112-C Precision Boring.



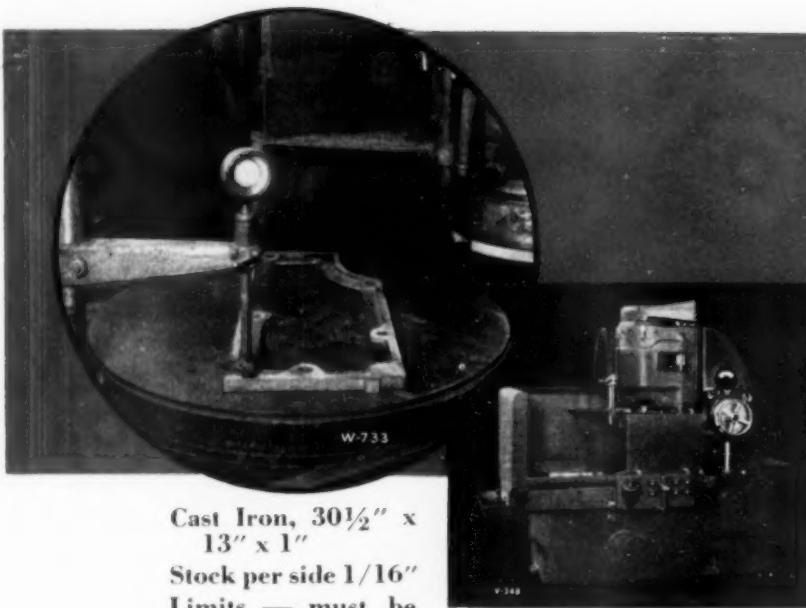
To get best use of your Ex-Cell-O precision boring equipment, you should have the Ex-Cell-O Instruction Book. If you do not have it, write for free copy. State style of Ex-Cell-O machine you are using.



THREAD GRINDING, BORING AND LAPING MACHINES • TOOL GRIND-HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CONTINENTAL TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT PAK CONTAINER MACHINES • R. R. PINS AND BUSHINGS • PRECISION PARTS

EX-CELL-O means PRECISION

"PUT IT ON THE BLANCHARD"



Cast Iron, $30\frac{1}{2}''$ x
 $13''$ x $1''$
Stock per side $1/16''$
Limits — must be
parallel
Number of Sides 2
2 pieces (4 sur-
faces) per hr.

Here the easiest way is also the best. This is a difficult job to do any way but on a Blanchard. The piece is of thin section and apt to spring if it is locked in a fixture strongly enough to hold it. The piece is shimmed the first time and a clean-up cut is taken. It is then turned over and a light cut taken on the other side. This operation is repeated four or five times before it is finished.

**The BLANCHARD
MACHINE COMPANY**
64 STATE STREET, CAMBRIDGE, MASS.



Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



**CHECK THESE
ADVANTAGES
OF BLANCHARD
GRINDING**

Production

Adaptability

Fixture Saving

Operation Saving

Material Saving

★ Fine Finish

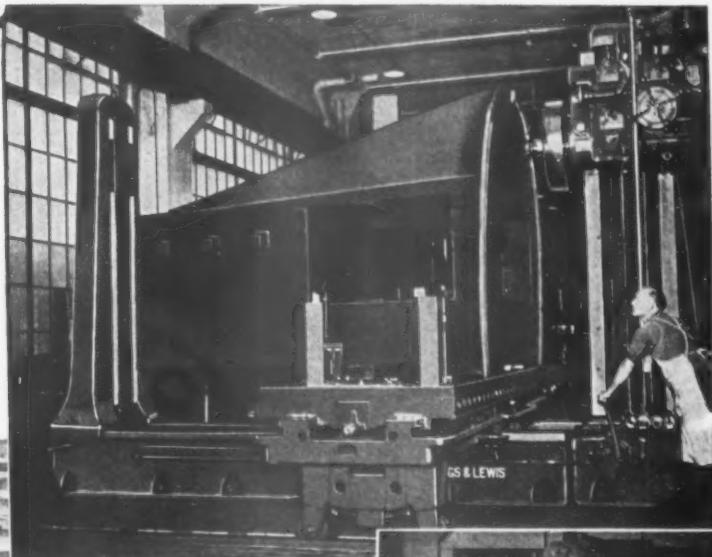
★ Flatness

Close Limits



..... Especially
valuable on jobs like
the one illustrated.

"Scratch One Flat-Top"



"SCRATCH ONE FLAT-TOP"—there's a story behind these words that's never been told—it's a story of American ingenuity, careful workmanship, design and production—a story of precision machine tools, like the

Giddings & Lewis 350-T High Power, Precision, Horizontal Boring, Drilling and Milling Machine illustrated above, doing a job that produces planes whose pilots make history in words like these. The G&L Horizontal shown above is milling the flange surface of a large airplane fixture—holding the overall flatness to .005". This is but one of many precision jobs handled for the aircraft industry. Boring, Drilling, Milling, Facing, Tapping and Thread Cutting operations are performed on other large fixtures to unbelievably close tolerances, and in record time.



We're proud of the machine that does these jobs that eventually deliver the planes worthy of the men that fly them—jobs that help to "Scratch One Flat-Top."

LARGEST BUILDERS OF HIGH POWER, PRECISION HORIZONTAL
BORING, DRILLING AND MILLING MACHINES

Table, Floor, Planer and Multiple Head Types

GIDDINGS & LEWIS MACHINE TOOL CO.
Fond du Lac, Wisconsin



The aircraft hose and the Mill-Supply Salesman traveled de luxe—and Planes left the factory a week ahead!

Fighting planes were grounded—inside the factory! Production was slowing—soon would stop unless critical hose could be had immediately. Not a foot of it anywhere in the City—ordinary shipments would arrive too late. What to do?

Just *one* thing to do—and the plane manufacturer *did* it! He called in his Mill Supply Distributor, who right away got the rubber company on long distance.

That night one of his men hopped the Limited—picked up the hose next morning—made an extra sleeper reservation—and traveled back with all that hose in a berth!

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

That emergency delivery kept planes pouring down the line and saved the manufacturer a full week's production. Nobody *ever* will know how much those extra days' output have helped to speed the Peace!

It was all in the day's work for the Distributor. But it carries a big moral:—*in* a pinch or *before* a pinch, always call in the Industrial Supply Man.

You can depend on his resourceful help—we *know* you can, because for many years he and other Distributors all over America have represented us in selling Cle-Forge High-Speed Drills and Peerless High-Speed Reamers.



Awarded May 22, 1942
Superseded July 13, 1942

The **CLEVELAND** TWIST DRILL COMPANY
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES
1242 EAST 49th STREET CLEVELAND
30 READE ST. NEW YORK 9 NORTH JEFFERSON ST. CHICAGO
6515 SECOND BLVD., DETROIT LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST., E.C.4
650 HOWARD ST. SAN FRANCISCO



"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU



Awarded August 8, 1942



What ever happened to the Horse Collar Market?

Who won the World Series in 1935? Who was vice-president under Harding? Of 1481 makes of American automobiles, 16 are known today. How many of the others can you name? And what ever happened to the carriage wheel business, and where's the horse collar market?

People, products, markets and methods all succumb to change . . . and today that powerful factor of change is doing more to disrupt markets, create new products, and revise production methods than most businesses are even remotely prepared for!

A soap company and a roofing company are operating shell-loading plants. Shipbuilders are building cargo planes. The automotive industry is producing farm machinery, locomotives, air conditioning equipment, and literally hundreds of other unrelated products. Manufacturers are this year spending hundreds of millions of

dollars on research alone, and the day this war ends, a new age of production will begin.

Part of this story of change we know first hand, as only specialists can. That part is in the vital and highly specialized field of internal grinding . . . and this much we can tell you on the basis of our own experience with the amazing developments in production that we have seen and helped to produce:

If your business is manufacturing with metal, and if you are planning ahead today for the products you will manufacture tomorrow, the surest way to protect your business against failure from uneconomical production methods is to consult with the leading specialists in machine tool engineering.

Bryant's Consulting Service is available to you at all times. Call upon us now!

Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U. S. A.



MARCH, 1943

SEND FOR THE MAN FROM BRYANT



Why we work against Inspectors

The inspector maintains quality by finding and throwing out substandard parts. **HECKER**'s job is to help make subquality hard to find. We'd be the last to say that better tools, **HECKER** tools, make the inspector's job easier. But we do know that our tools have minimized rejects in many well-known plants.

In *designing and building* tools **HECKER** engineers work with firsthand knowledge of production problems. They know the men and machines of our many regular customers. They know the production problems of our own operations on close-tolerance parts for aircraft. Their extra know-how comes from the production floor where the problems are.

Your big problem may be to speed up your output per machine. Or, it may be reduction of rejects. Or both. Whatever it is, let us demonstrate **HECKER** service on your meanest tooling problem. Write A. W. Hecker, 1988 East 66th Street, Cleveland, Ohio, or 517 New Center Building, Detroit, Michigan.



A•W• *Hecker*

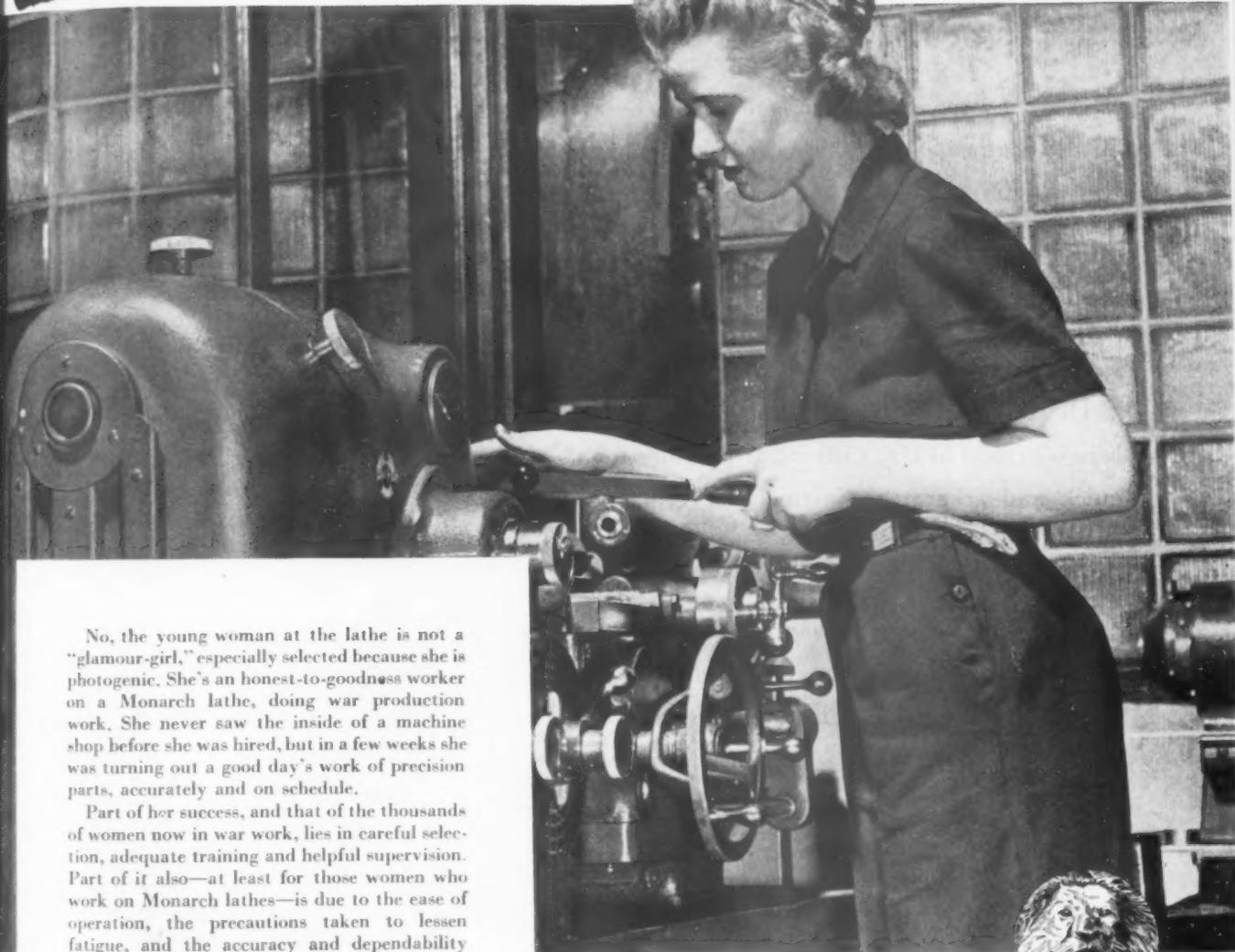
DESIGNERS AND BUILDERS OF TOOLS, JIGS AND FIXTURES . . . FABRICATORS OF AIRCRAFT PARTS

GRINDERS
LATHE
MILLING
OPERATORS

ALSO

Draft Exempt Men
Who have some mechanical ability.
Hourly rate, plus overtime.
58 Hours Week
WAR WORK
If now on war work
do not apply.

Women
Welcomed!



No, the young woman at the lathe is not a "glamour-girl," especially selected because she is photogenic. She's an honest-to-goodness worker on a Monarch lathe, doing war production work. She never saw the inside of a machine shop before she was hired, but in a few weeks she was turning out a good day's work of precision parts, accurately and on schedule.

Part of her success, and that of the thousands of women now in war work, lies in careful selection, adequate training and helpful supervision. Part of it also—at least for those women who work on Monarch lathes—is due to the ease of operation, the precautions taken to lessen fatigue, and the accuracy and dependability built into Monarchs.

For the vast majority of turning work done on Monarchs, you can welcome women at your employment office and in your plant. The substitution of "woman-hours" for man-hours will effectively help give you more machine-hours. If you'd like some firsthand information on the subject, send for the booklet "Women in Production Work." It's yours for the asking.

THE MONARCH MACHINE TOOL COMPANY
SIDNEY ••• OHIO

MONARCH
LATHES

*Cover the
Turning Field*





M
CO

THIS MARK TELLS YOU

"IT HAS TO BE GOOD"

The PM Diamond Emblem is never put on a single tool until *after* it is checked against our own exacting standards of precision, hardness and finish. PM Tools carry this mark as assurance to you of their essential goodness—their ability to turn out accurate work under tight production schedules.

The PM heavy-duty Face Mill illustrated here is typical of PM Cutters. It provides for quick and accurate adjustment or replacement of the cutting members, and maintains a high degree of precision under severe usage.

PM Small Tools and Gages are ready to help you produce more units—of controlled dimensional accuracy and uniformity.

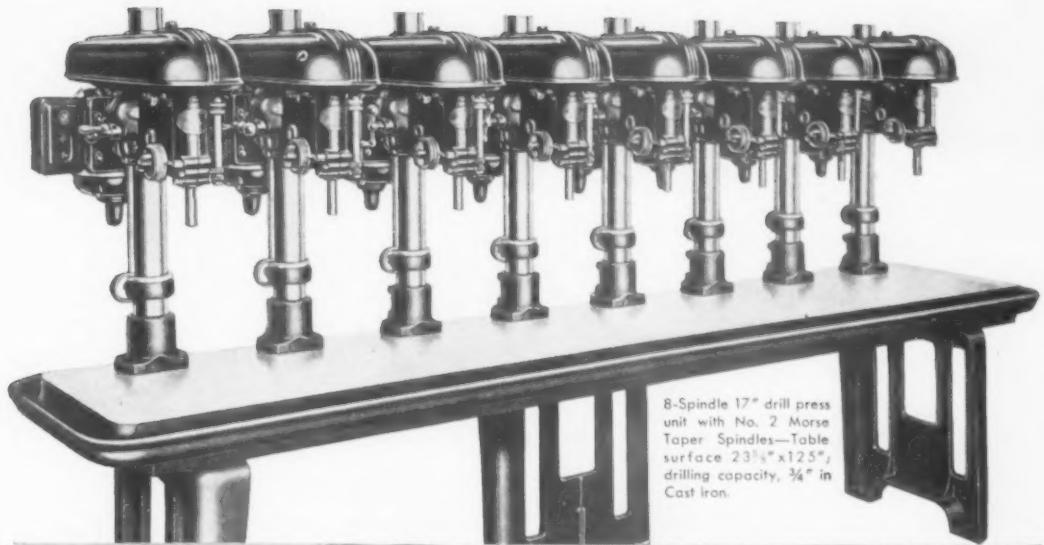


THE NEW PM CATALOG shows a wide variety of standard gages that are regularly stocked for immediate delivery. And correspondence is invited on special tools and gages of all types.



The PIPE MACHINERY COMPANY Cleveland, O.

GAGES • HOBS • MILLING CUTTERS • SPECIAL TOOLS



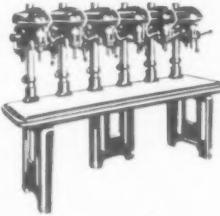
8-Spindle 17" drill press
unit with No. 2 Morse
Taper Spindles—Table
surface 23 $\frac{1}{2}$ " x 12 $\frac{1}{2}$ ";
drilling capacity, $\frac{3}{4}$ " in
Cast iron.



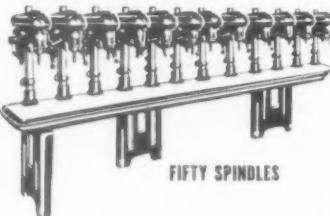
TWO SPINDLES



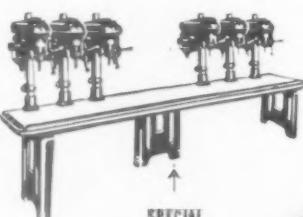
THREE SPINDLES



SIX SPINDLES



FIFTY SPINDLES



SPECIAL SET-UPS



THE ARMY-NAVY "E"—Awarded for excellence in the production of machine tools vitally needed in the war effort.

THE DELTA MANUFACTURING COMPANY
610-C E. Vienna Ave., Milwaukee, Wis.

Please send us without obligation full information on your new drill press development. We are interested in... drill presses on this set-up17",14", spaced inches apart.

Name.....

Address.....

City..... State.....

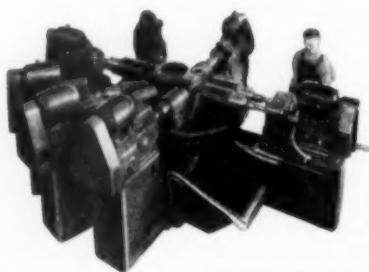
*Here's how to get and maintain
the production you need . . .*

WITH LESS EQUIPMENT

**STANDARD AUTOMATIC UNITS *plus* SPECIAL TOOLING OFFERS
BETTER SOLUTIONS TO DRILLING, BORING, MILLING PROBLEMS**



It is not uncommon to find an installation of but a few special machine tools wiping out the need for batteries of standard machines doing the same operations. There are two basic reasons for this. Often times standard machines are purchased in quantity before giving sufficient thought to the proper method of processing the work. In other cases, the periodic need for increased production has resulted in the addition of duplicate equipment, resulting in too many machines doing the same job.



A TYPICAL INSTALLATION

This precision boring machine bores 9 holes simultaneously in aluminum-alloy accessory housing.

PRODUCTION INCREASED 6 TIMES

Machining time was cut from 30 to 5 minutes, floor-to-floor, with complete and assured uniformity.

DIAMETER HELD TO $\pm .0005"$ — LOCATION $\pm .0001"$ ANGULAR LOCATION ± 15 SECONDS.
Elimination of individual settings and numerous gaugings made it possible to consistently maintain these close tolerances.



Whatever the cause, Unit-Type machine tools make practical solutions to most of these production problems. However, before designing a new machine to accommodate multiple operations, it is necessary to make a preliminary study in order to determine your most productive machining sequence.

EXPERIENCED ENGINEERS AVAILABLE TO ASSIST IN TOOLING

Our engineers will be glad to make an analysis of your present machining sequence with a view towards increasing your production with special machine tools. Wherever possible they will recommend our unit-type machines. These are made from standard hydraulic self-contained power units arranged to suit the most practical tooling of your work. Being standard, you save engineering and pattern costs for complete feed and drive units. Send in your part prints and production requirements for an estimate . . . there is no obligation.

Free!

PRODUCTION AND TOOLING IDEAS

Get these 8 bulletins today. Each traces a machining problem from the original production requirements to the final machine design. Each may suggest a tooling or production set-up that you can use today — valuable file information for tomorrow. Ask for bulletins M30 through M38.



1. Six spindle vertical machine for drilling and counterboring airplane engine crankcase. 2. Six unit machine with index table for multiple operations on airplane engine part. 3. Four way machine for various drilling operations on airplane engine crankcase.

W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

IF CLUTCHES SLIP *production slips, too!*



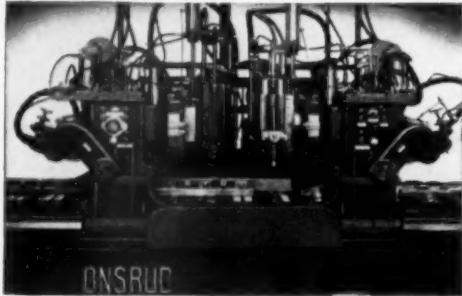
KEEP ALL HEADSTOCK CLUTCHES PROPERLY ADJUSTED

For six top speeds, check your forward and high speed clutches. For slow speeds, check your forward and low speed clutches. Never adjust a clutch so tightly that it won't fully engage. See instructions in your service manual.



Reprints of this page are available for bulletin board use in your turret lathe department. Write the Gisholt Machine Company, 1229 East Washington Avenue, Madison, Wisconsin. Ask for "War Time Care and Operation Poster No. 2." State quantity desired.

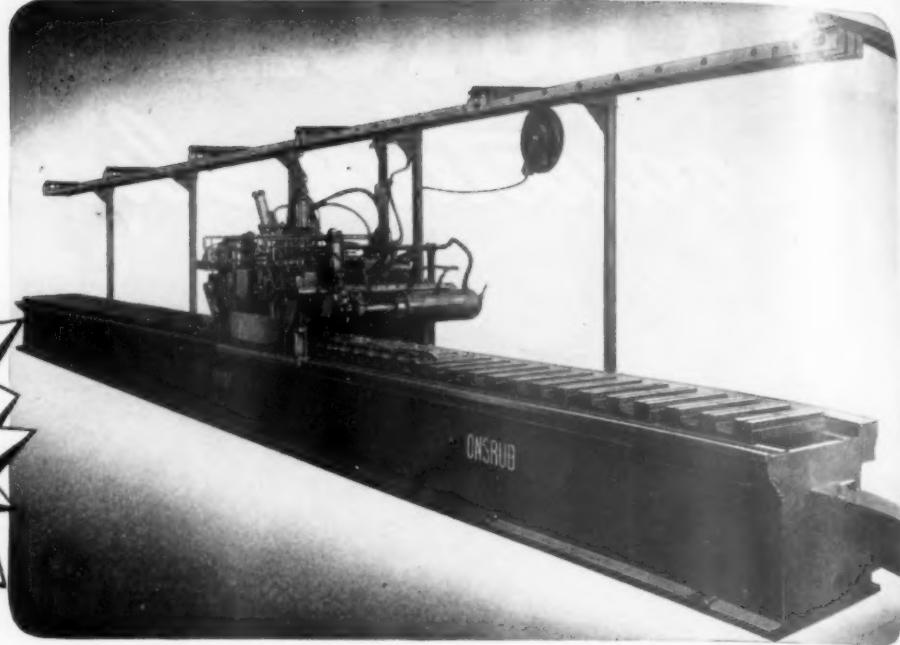
The Machine
that
Blasts
Bottlenecks!



Complete carriage assembly showing cutter motors and front operating stations. G.E. Thy-mo-trol unit converts A.C. line to D.C. permitting use of D.C. carriage feed motor and stepless rheostat speed control.



A view of the Cam Bar for Automatic Feed Control to slow down or speed up carriage travel according to the cutting demands made by the work. Proper feed rate is automatically maintained.



The new Onsrud A80-A Automatic Contour Miller increases still more the type of high speed production machining originated by the Onsrud Spar Miller. This new machine brings to a high degree of perfection the new milling technique which is effecting such important savings in aircraft manufacturing man-power, time and machines.

Taking cuts in both vertical and horizontal planes in one operation, the A80-A greatly simplifies and speeds up production of long, intricate shapes from billets or extrusions. Features like the following are responsible for the machine's high production rate and capacity for unusual types of work.

Four Cutter Heads

Two vertical and two horizontal. Up to four cuts in one operation. One of the vertical heads tilts under automatic pneumatic control to make varying angle or twist cuts.

Variable Speed Carriage

The carriage rides on a precision machined bed to feed cutters to the work at any speed from 2" to 18½" per minute.

Sectional Bed Construction

Bed is made up of combinations of 7½ and 15 ft. sections to any length desired.

For a complete and detailed description of the A80-A send for bulletin. Draw on our long experience in the field of high speed cutting and machine tool design to help you solve your machining problems. Write today to the

Open Grate Table

Built in 20 in. sections. "T" slots on 9 in. centers permit air or hydraulic clamps to be placed below table surface. Speedy loading and unloading results.

Extra Carriage Support

A removable front carriage support makes possible greater rigidity when work requires.

High Cutter RPM

Cutters are driven by individual motors with ample power to maintain cutting speeds for all types of cuts.

Onsrud

ONSURUD MACHINE WORKS, INC.

3927 Palmer Street, Chicago, Illinois, U.S.A.
Sales Offices in all Principal Cities

MACHINE TOOLS AND METHODS FOR TOMORROW'S PRODUCTION

MORE* PRODUCTION FROM PLANERS...

*(Increase varies with type of production.)



with ROTOTROL and Westinghouse VARIABLE VOLTAGE DRIVES

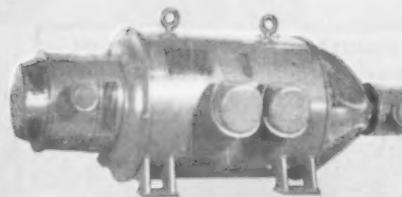
"In our opinion, for equivalent planer construction, a minimum increase in production of 15% can be expected by using a Westinghouse Variable Voltage Drive."

This statement by the general manager of a plant equipped with Westinghouse Planer Drives is more than verified by other users' experiences. Faster return speeds and more accurate stopping are made possible by Westinghouse ROTOTROL—a control method that permits faster acceleration and deceleration, and holds the planer motor speed constant over the entire speed range. As a result, MORE cutting strokes per minute are obtained.

At the same time, machine outages for maintenance of controls are reduced, because the Westinghouse Variable Voltage Drive requires less than half the usual number of contactors, relays and interlocks used on older types of drives, and involves almost 2/3 fewer electrical operations per planer stroke.

Get the full story on this faster, more flexible, proved planer drive. Check your Westinghouse representative today or write Westinghouse Electric & Manufacturing Co.

J-21203



WHAT THE WESTINGHOUSE VARIABLE VOLTAGE PLANER DRIVE DOES

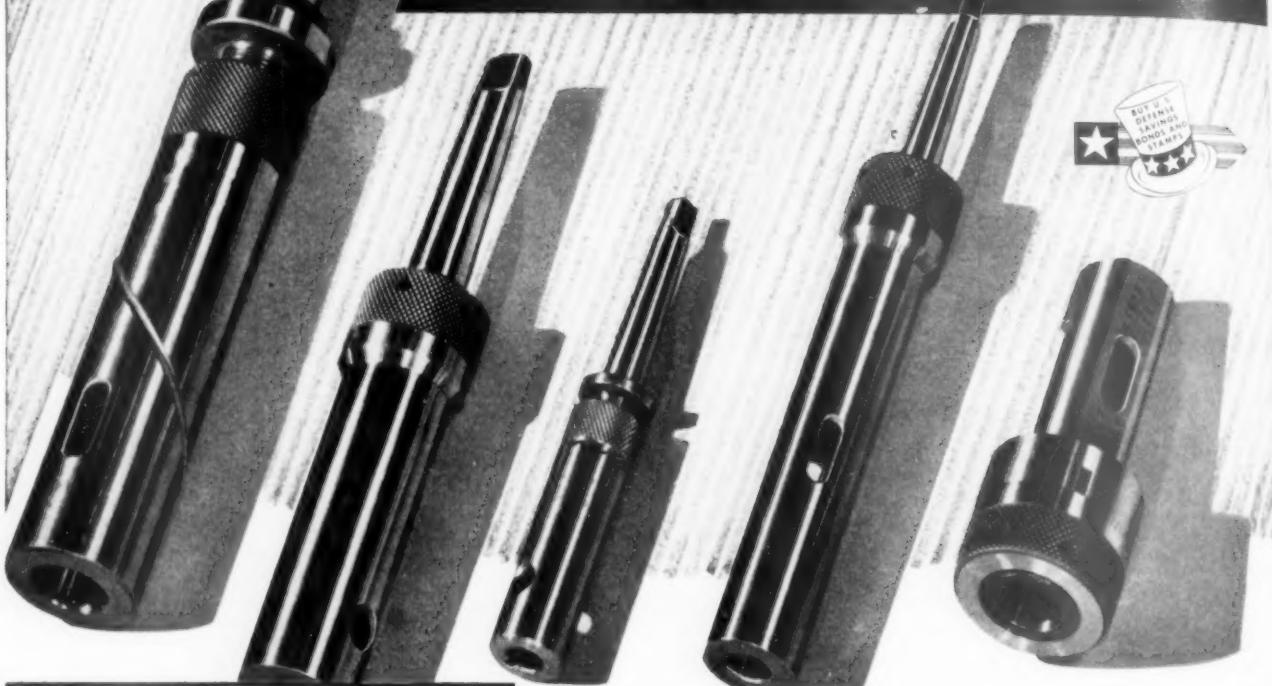
- Gives more cutting strokes per minute. Faster acceleration and deceleration. Speeds reversing time.
- Reverses accurately to a line—provides accurate control for planing up to shoulders or in blind pockets.
- Provides closely regulated speed at any setting over entire range, regardless of voltage or load fluctuations.
- Cuts machine outages for control maintenance.



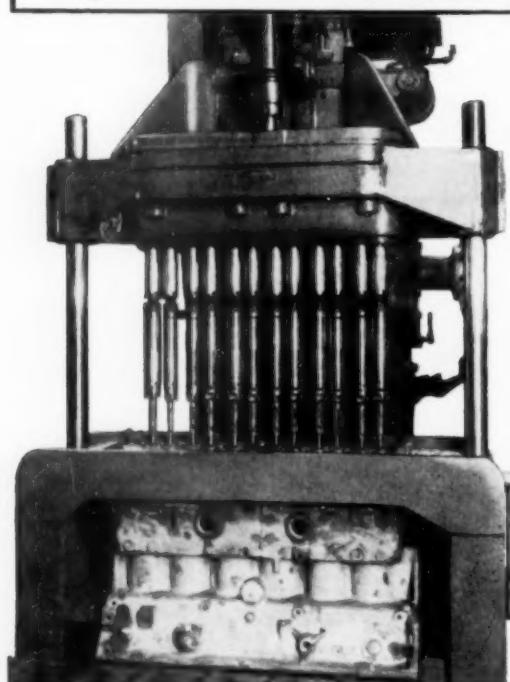
Westinghouse

VARIABLE VOLTAGE DRIVES

Compensate for TOOL WEAR and UNEQUAL TOOL LENGTHS on single and multiple spindle jobs with MIDWEST ADJUSTABLE EXTENSION HOLDERS



MIDWEST ADJUSTABLE EXTENSION TOOL
HOLDERS in use for FINISH REAMING Operation
on Cylinder Blocks in a Detroit Automotive Plant



- ADJUSTMENTS CAN BE MADE IN STEPS OF .001 OF AN INCH.
- OPERATOR CAN MAKE ADJUSTMENTS BY HAND—NO TOOLS NEEDED.
- SET-UP TIME IS REDUCED.
- DESIGN IS SIMPLE, CONSTRUCTION RUGGED. ALIGNMENT ACCURATE.

HERE'S HOW THEY WORK

Midwest holders are provided with an extremely accurate, ground fit between the sleeve and the shank. A knurled, graduated collar which controls the adjustment is located at the top of the sleeve. A key fixed in the sleeve, with a sliding fit to a keyway in the shank provide a positive drive.

Micrometer, longitudinal adjustment steps of .001 of an inch are made by turning the collar one space on the bevelled edge, graduated scale. The collar holds firmly at all positions of the scale. There are no screws or locknuts to give trouble and, without tools of any kind, the operator can easily make the adjustment by hand.

MIDWEST TOOL & MFG. CO. • 2364 W. Jefferson • Detroit, Mich.

END MILLS • SLEEVES • COUNTERBORES • DRILLS
SPECIAL TOOLS • REAMERS • FORM TOOLS
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

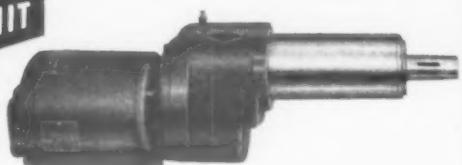
Precision METAL CUTTING TOOLS

MIDWEST

THE TOOL ENGINEER

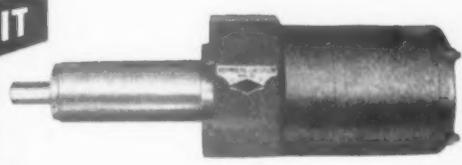
DESIGN YOUR OWN PRODUCTION MACHINES WITH REHNBERG-JACOBSON UNITS...

DRILL UNIT



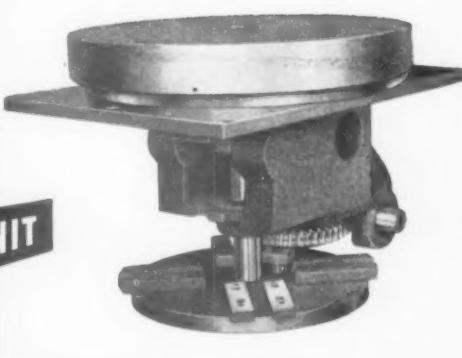
A self-contained cam-operated unit which operates through a complete cycle and stops. No base is required as the unit is mounted by a finished cylinder with holding screws through flanges. Designed for plain, step, or center drilling, or for spot facing, and can also be used for milling. In four sizes, from $\frac{3}{16}$ " to $1\frac{1}{2}$ " holes in steel. Different size units have different designs; small unit is shown at right, larger units on machine below.

TAP UNIT



A self-contained tapping unit with interchangeable lead screw, reversing limit switches, and a built-in "plugging" switch. It is made in four sizes, for tapping the same size holes as the Drill Units described above.

INDEX UNIT



A complete table, with modified Geneva stop motion indexing mechanism, and cam-operated nitrided locking pin for each position. Mounts, through a hole of suitable diameter, on any machine base. Table sizes: 16", 20", 24", 30", 36". Positions: 4 to 16.

Write for Circular E-5 showing data on above units and how they have been used in complete machine designs

REHNBERG-JACOBSON MANUFACTURING CO.
Special Machinery

2137 KISHWAHKEE ST. ROENFORD, ILLINOIS



CLECO SHEET HOLDERS

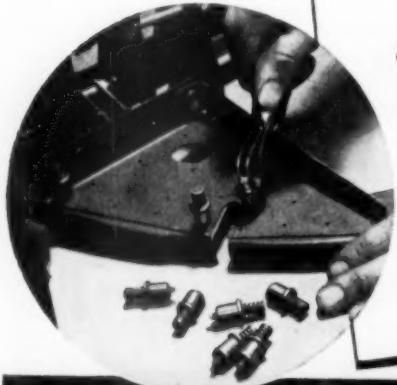
Why the ORIGINAL Sheet Holder
Offers You the FINEST Service:

1. Saves 80% of time ordinarily required for securing sheets prior to riveting. Eliminates use of holding screws or bolts.
2. Exerts 50 lbs. of even clamping pressure—no buckling or distortion—no loosening due to vibration of riveting.
3. Different color for each size facilitates identification, speeds up insertion.
4. Access to only one side is necessary for insertion and removal.
5. Locking stem has correct diameter for rivets being used—no drilling or reaming.
6. EXCLUSIVE REPAIR AND EXCHANGE SERVICE. Damaged sheet holders can be sent to our plant or branch office repair stations for prompt repair at nominal cost. Exchange stocks also available at these repair stations.

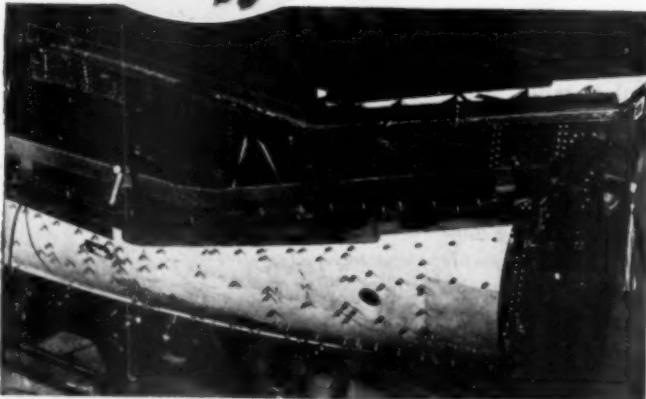
Write for Bulletin 87. THE CLEVELAND PNEUMATIC TOOL COMPANY, 3781 East 77th St., Cleveland, Ohio. Branch offices in all principal cities.



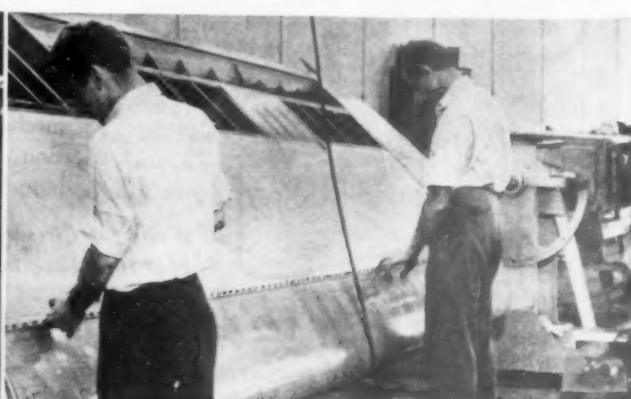
*Cleco Sheet Holders
being used on a
Nose Web*



★ BUY U. S. WAR BONDS AND STAMPS



Cleco Sheet Holders on a Fuselage Assembly in Jig



"Clecoing" an Airplane Wing



CAM LOCK SPINDLE NOSE

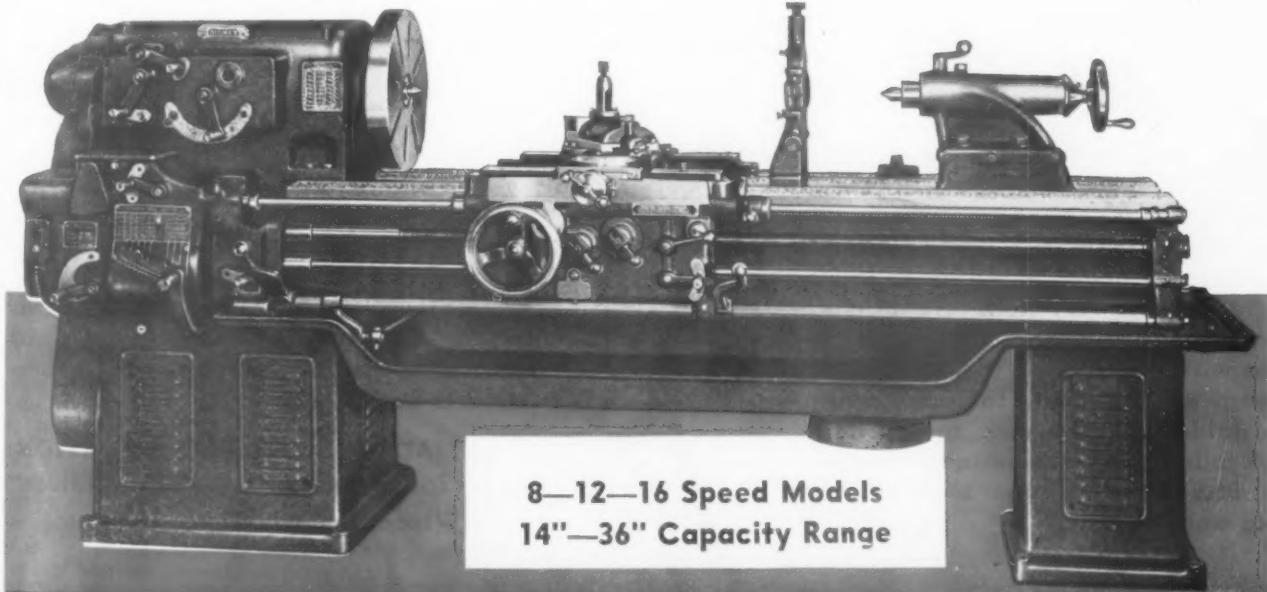
*steps up
versatility
of
Sidney
Lathes*

Today Speed, Accuracy, Versatility play important parts in stepping up War production to meet urgently needed weapons and equipment. The Cam-lock Spindle Nose recommended for Sidney Lathes has several distinct operating advantages.

The chuck or face plate is mounted on the tapered portion of the nose and driven by accurately fitted pins equally spaced on face of chuck or face plate. These pins, by their cam-locked action, lock the work holding fixture securely to the spindle.

Also the entire chuck or face plate with work may be removed and further operations completed on another machine, maintaining perfect alignment and accuracy, due to interchangeable feature of locking pins on spindle nose.

Bulletins covering all models available on request.

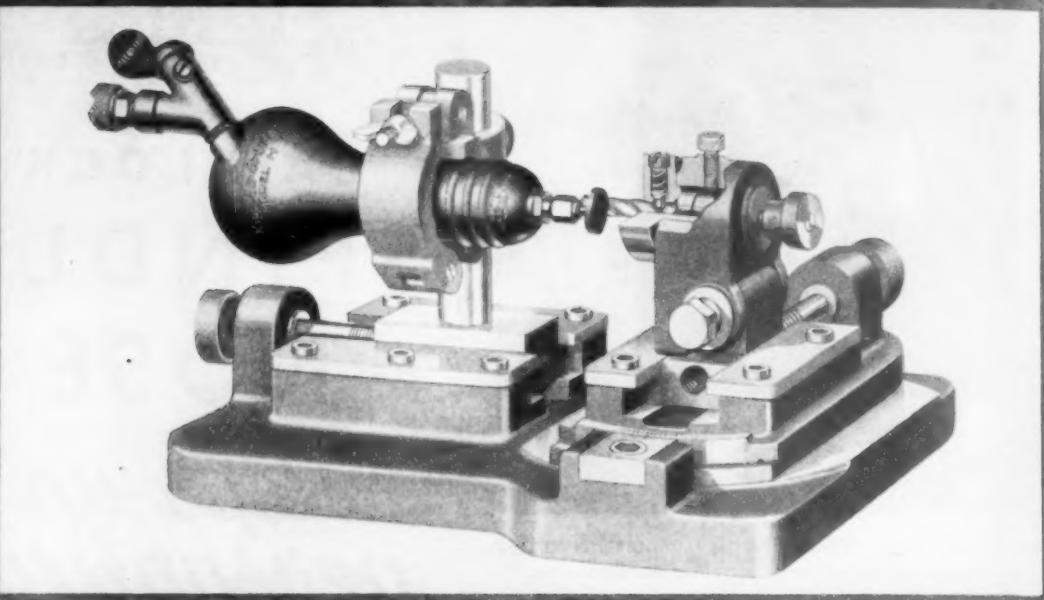


The SIDNEY MACHINE TOOL Company
Builders of Precision Machinery

SIDNEY

ESTABLISHED 1904

OHIO



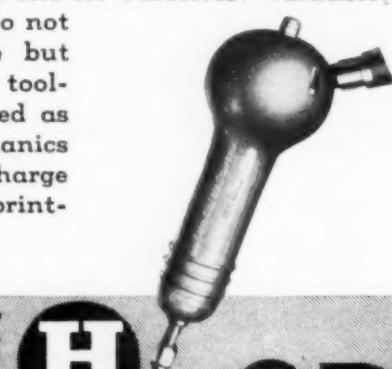
WAR-TIME SUGGESTION from Madison-Kipp

If you have to make some of your own special drills, reamers, counterbores, etc., etc., to get them in time for your urgent needs, you may be interested in the Kipp Air Grinder Fixture illustrated above. We made one for ourselves and it works very well. We do not manufacture them for sale but we will gladly send you our toolroom sketch sheets to be used as a guide for your own mechanics to follow, for a nominal charge of fifty cents to cover blue printing and mailing.

You can, of course, vary this fixture design to suit your own requirements, but the basic idea is very good and if you make it complete, as shown, you will find that it is extremely valuable.

The Kipp Air Grinder, as well as the Kipp Air Grinder fixture, was developed by practicing toolmakers so both are practical.

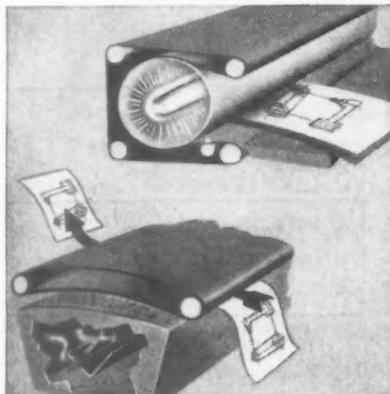
MADISON-KIPP CORPORATION,
209 Waubesa Street, Madison,
Wisconsin, U. S. A.



The New Model
KIPP  *air*=**GRINDER**

THINK WHAT OZALID WHITEPRINTS ARE SAVING US

Thousands of manufacturers using the Ozalid Process point to "everyday" savings in time, labor, and materials—savings which are doubly appreciated when you're rushing supplies to our armed forces.



TIME An Ozalid machine turns out whiteprints of engineering drawings, charts, letters, in two quick steps—Exposure and Dry Development. There's no washing, drying, fixing . . . no cumbersome equipment with a hundred "breakdown" possibilities. Ozalid transparent prints—which may be used in place of valuable original tracings—are produced the same way. No "time outs," as in blueprinting, to change solutions...to rethread the machine.



LABOR Any inexperienced person can be quickly taught to operate an Ozalid whiteprint machine at top efficiency . . . there's never a "labor" problem.

And when draftsmen have to make changes in the design of drawings, precious man-hours can be saved because it's never necessary to redraw any part which remains the same as in the original.



MATERIALS Cut sheets as well as roll stock can be accommodated in an Ozalid whiteprint machine. Thus, by using sheets which correspond in size to your originals, you can completely eliminate trimming waste.

Further conservation is possible because no paper is lost pasting up "leaders." Nor are any Ozalid whiteprints unusable due to distortion.

WRITE FOR SIMPLIFIED PRINTMAKING

Our illustrated booklet explains the Ozalid Process and contains samples of Ozalid whiteprints with black, blue, maroon, and sepia lines on white background.

Ozalid Products Division

GENERAL ANILINE & FILM CORPORATION

Johnson City, N. Y.

**ARE YOU ACQUAINTED
WITH THE**

GRAPHITICS?

They're a record-breaking, precedent-shaking, breath-taking family of tool and die steels. Ever since they established residence in the steel market five years ago, they've been going to town in a big way.

They're a really talented family. All five members machine at least 25% easier than competitive steels and wear longer. They resist abrasion and eliminate seizing. Get acquainted with them today. Here's a little biographic data for your convenience:

STEEL	QUENCH	DEPTH OF HARDNESS	OUTSTANDING CHARACTERISTICS
Graph-Sil	Water	Deep	Easy Machining Long Wearing Non-seizing
Graph-Mo	Oil	Deep	Easy Machining Long Wearing Non-deforming
Graph-Tung	Water or Brine	Medium	Easy Machining Long Wearing Resists Extreme Abrasion
Graph-Al	Water	Shallow	Easy Machining Long Wearing Resists Impact
Graph-M.N.S.	Air	Shallow	Easy Machining Long Wearing Non-seizing



THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

*The One Test For Every Decision—
Will It Help To Win The War?*

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
GRAPHITIC STEELS

THE TOOL ENGINEER



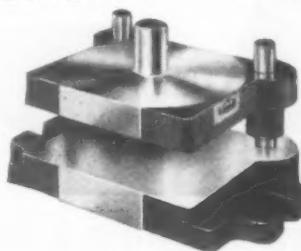
Axis of *WHAT?*

Axis of defeat for Germany, Italy, and Japan, is the idea of those workers at Danly now engaged 100% on war production. Die sets are this company's principal product. Die sets are being made in capacity quantities, in 3 shift, 24 hour, continuous operation to enable other American people to meet their tooling programs.

This company, as prime and sub-contractor, has also taken on the difficult task assignment of producing weldments of extreme accuracy, both as to welding and machining.

That task assignment is being carried out, for the defense of America and the defeat of the Axis.

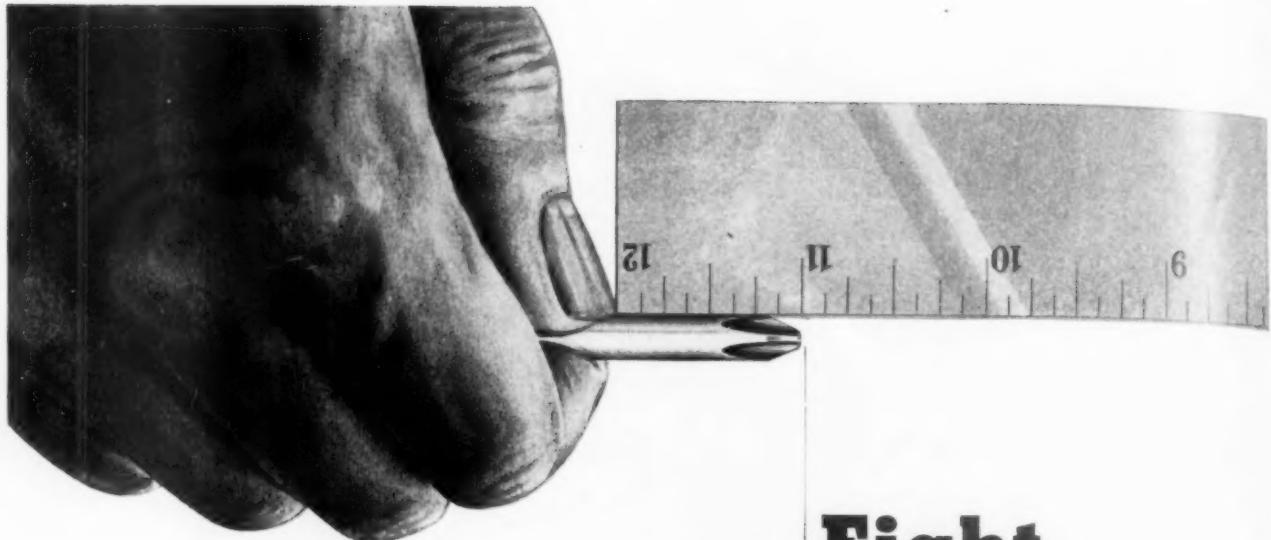
DANLY DIE SETS



WELDED STEEL FABRICATION

DANLY MACHINE SPECIALTIES, INC.
2100 SOUTH 52nd AVENUE • CHICAGO, ILLINOIS

MILWAUKEE • DAYTON • ROCHESTER • LONG ISLAND CITY • DETROIT • CLEVELAND
PHILADELPHIA • • • • DUCOMMUN METALS & SUPPLY COMPANY, LOS ANGELES



Eight lives to the inch!

SOME Apex-Phillips power bits have as many as *eight* and more useful lives. And *all* Apex-Phillips bits (except a very special few) have *several* useful lives.

It's like this. You use Apex-Phillips bits until they are worn out. Yes, even the tough, long-wearing steel we use gets worn after a while and we admit it. Then you send a batch of used Apex bits back to us. We fully recondition the bits, make 'em just as good as new in every respect. Approximately one-eighth of an inch is removed in the reconditioning, and that's where you get the extra service-lives.

The cost of reconditioning is a fraction of that of new bits. You save money. And together we save vital tool steel. So if you use Phillips screws, use Apex-Phillips Bits, get multiple service life, and save. Write for Catalog 15.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Power Bits for Phillips, Slotted Head, and Clutch Head Screws; and Hand Tools for Phillips and Clutch Head Screws.

Phillips Bit Reconditioning Service for the Pacific Coast at
the Burklyn Co., 3429 Glendale Blvd., Los Angeles, Calif.

Apostle of the *Impossible*!



He's a strange sort of genius compounded of curiosity, skilled hands and a peculiar mental twist . . . He has visions of impossible things.

One day recently, the National Inventors Council in Washington — America's clearing house for war-winning inventions — had a letter from him. It read: "Sirs: I've a couple of ideas in my head that may be of military importance. Kindly send me your bulletin so that I'll know what to do to help. Yours for Victory!"

And today, one of those ideas is helping to win the war — literally "Yours for Victory."

This is a typical story of America's Apostles of the Impossible, the inventors, the builders and the basement-bench Edisons who have submitted to the Council more than 50,000 ideas and inventions in less than 24 months. All have been carefully examined, hundreds are today being tested, and scores are actually at work winning the war and strengthening America's production lines for the peacetime pull ahead . . . But America needs more!

We at Jones & Lamson have a fair share of "apostles." They are attracted to our kind of work. Through more than a century of our history, these men, with visions of impossible things, have helped to design and develop a formidable list of America's great inventions and many of the basic machine tools in the front line of industry today. We've learned to respect their ideas, from the simplest suggestion to the most complex design — on the assembly line and in the laboratory — and we're urging them to help the government by submitting all promising plans to the National Inventors Council.

We hope that you too are seeking out such men, and helping to mobilize their inventive genius for the protection of the country — and the company — they're working for in this emergency.

For any counsel or assistance that we can give to you or to any individuals in your company on ideas involving the use of precision machine tools, Jones & Lamson engineers and service men are at your call.

Universal Turret Lathes • Fay Automatic Lathes • Automatic Thread Grinders • Optical Comparators • Automatic Opening Die Heads



JONES & LAMSON

MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.

Profit-producing Machine Tools

Are you making the most of SPARK TESTING?



...to separate mixed
tool steel stock



...to check on the steel
before hardening tools



...to segregate
tool steel scrap

You know the troubles that cases of mistaken identity in tool steels can cause in the tool room. They leave the door wide open for all kinds of grief—wrong heat treatment, resulting in ruined tools—valuable production time lost—skilled labor and critical metal wasted.

To avoid such difficulties, you will find spark testing a handy way to identify tool steel—whether you want to separate mixed tool steel stock, to check on the steel before hardening tools or to segregate tool steel scrap. True, spark testing doesn't

give the information of a chemical analysis, but it provides a quick check on the identity of the steel.

To help you develop more fully the possibilities of spark testing, we have prepared a "Guide for Spark Testing Tool Steels" in the form of a convenient 21" x 30" wall chart. It shows the characteristic sparks of the Carpenter Matched Tool Steels, including High Speed. It explains the effect that the different alloying elements have on the spark patterns. It also contains complete information on spark testing procedure—how to test most effectively, etc.

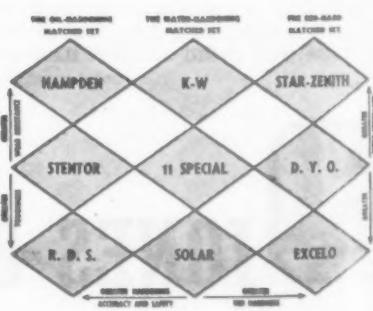


Used as a guide, this chart can help you train your men to quickly identify tool steels. It's offered free to tool steel users in the U. S. A. If you do not already have a copy, a request on your company letterhead will bring it to you.

THE CARPENTER STEEL COMPANY
122 BERN STREET • READING, PENNSYLVANIA

Carpenter
MATCHED
TOOL STEELS

IMPORTANT
BEFORE...
VITAL NOW



U PRECEDENTED OUTPUT

in war production . . .

...an achievement in which

P&J Automatic CHUCKING EQUIPMENT

plays an important part

PHOTO BY U.S. ARMY SIGNAL CORPS



The machine tool industry is justly proud of its contribution to the war effort. Unprecedented output of machines has been the backbone of the unprecedented output of airplanes, aircraft engines, tanks, Bofors guns, machine guns, adaptors for shells, the American made Oerlikon gun, and many other products for war use.

P&J machines, on the production lines of plants building these weapons, are busy turning out duplicate parts at top speed. Finish and accuracy are being maintained to highest standards so that assembly time is reduced to a minimum.

P&J offers its more than forty years experience to help step up war production to even higher levels.

The POTTER & JOHNSTON MACHINE CO.
Pawtucket, Rhode Island

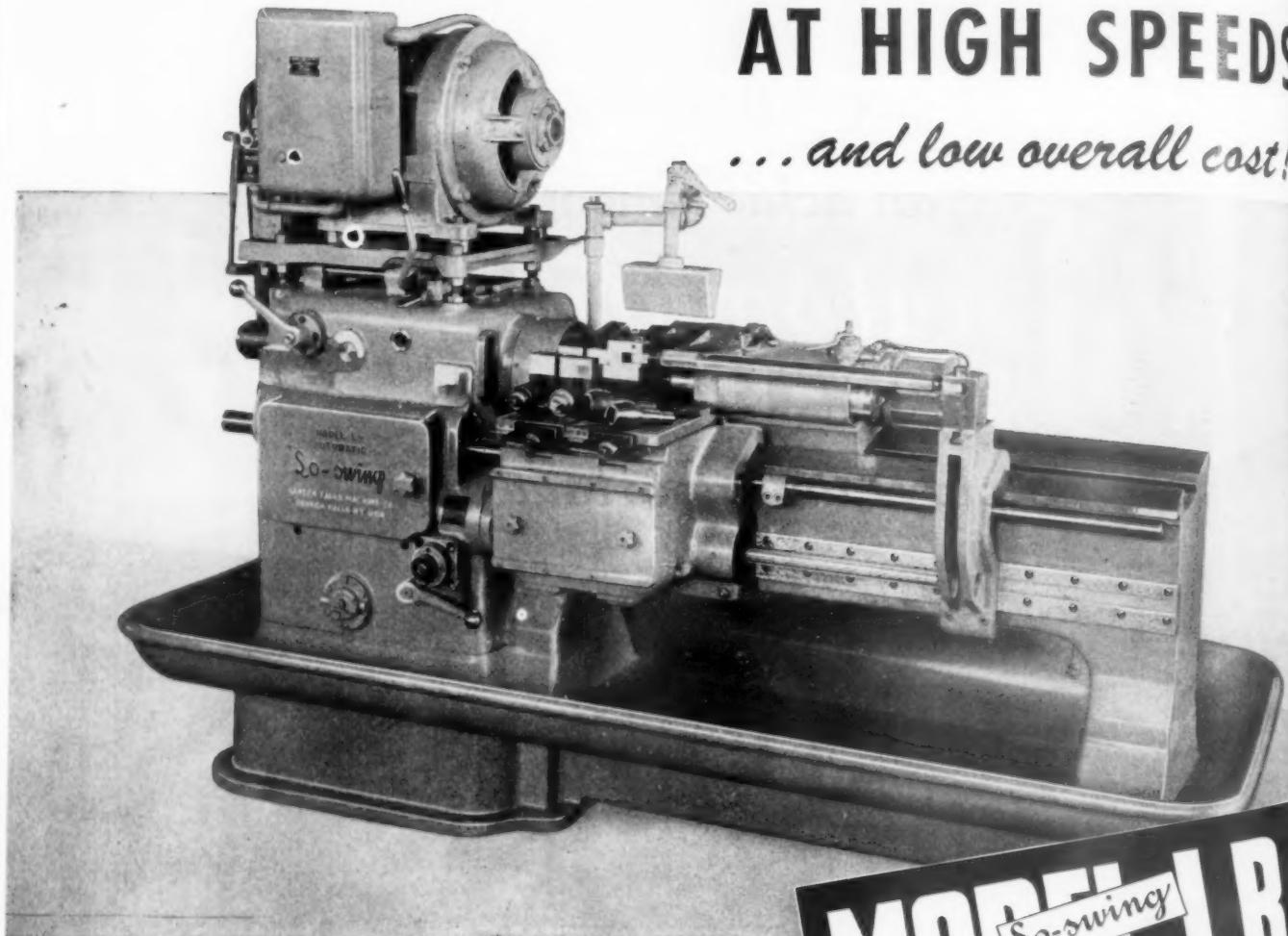


OUR BOYS WILL MARCH
BACK SOONER . . . IF WE
BACK THEM UP BY . . .

**Buying more
WAR BONDS**

DELIVERING CONSISTENT ACCURACY AT HIGH SPEEDS

... and low overall cost!



THE Model "LR" Lo-swing's field includes practically any work within its capacity—2" diameter for heavy stock removal, 4" diameter for light cuts, 5" diameter for flanged work—and up to 46" between centers in the longest bed length. Ease of setup and operation are provided not only by the Simplified Change-over Mechanism but by convenient levers for throwing in and out the feed and rapid traverse (normally automatic) manually, and by the low center height (37- $\frac{7}{8}$ ") which allows the operator to examine and adjust all tools from the operating position. Low center height also contributes to ease of loading.

The Model "LR" is designed to provide maximum efficiency with carbide tools. It is a versatile lathe in that it may be equipped with either direct V belt drive to the spindle for high speed, fine finishing cuts, or a geared drive with pick-off gears for slower roughing cuts. This lathe may also be equipped with a third slide (overhead) as well as additional back squaring attachments, carriages and carriage slides, making for innumerable tooling possibilities.

For the past several years, many of these lathes have been demonstrating their speed, accuracy, economy and stamina on the critical proving ground of continuous war production.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

MODEL LR
Lo-swing

... WITH

- SIMPLIFIED CHANGE-OVER MECHANISM
- SMOOTH HIGH-SPEED DRIVE THRU MULTIPLE "V" BELTS
- HEAD AND TAILSTOCK SPINDLES ON THREE PRECISION, PRELOADED BALL BEARINGS
- IMPROVED MECHANICAL BRAKE THAT OPERATES AUTOMATICALLY WITH START AND STOP LEVERS
- HARDENED STEEL WAYS
- OTHER FEATURES THAT REDUCE SETUP TIME

LATHE NEWS from **SENECA FALLS**



How **INCO** Technical Service helps you conserve critical materials

No matter whether newspaper headlines feature priorities, "PRP", or the Controlled Materials Plan, the need for conservation never lessens. The war must be fought and won. That means critical materials by the carload.

Perhaps you know that every pound of alloy must give maximum service if our far-flung fighting forces are to be supplied and maintained. Nickel, particularly, is needed to give wartime steels greater strength, toughness and resistance to impact.

INCO's technical staff is organized to serve users of metals and alloys—to help manufacturers find and adapt alternative materials without sacrificing desirable and essential characteristics in the finished product.

So if you have a problem involving the use of alloys—Nickel or otherwise—please write or wire for data or counsel from our technical staff.

NICKEL

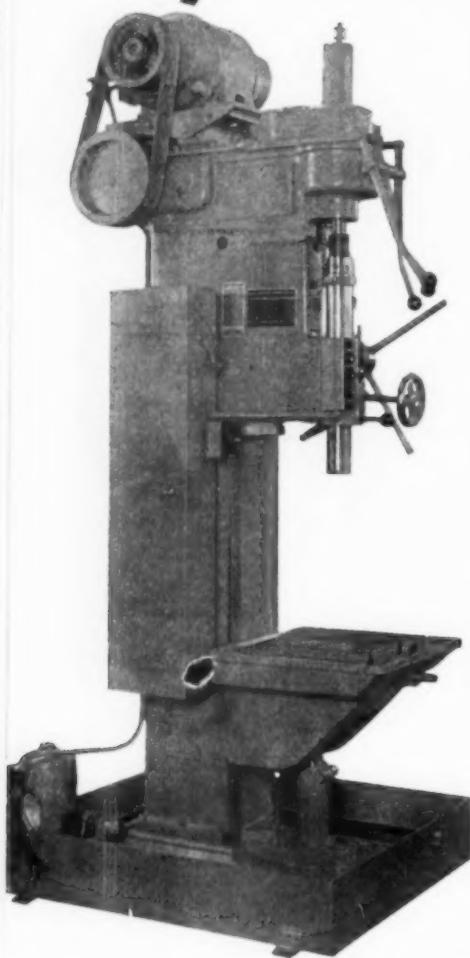
THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK, N. Y.

BAKER

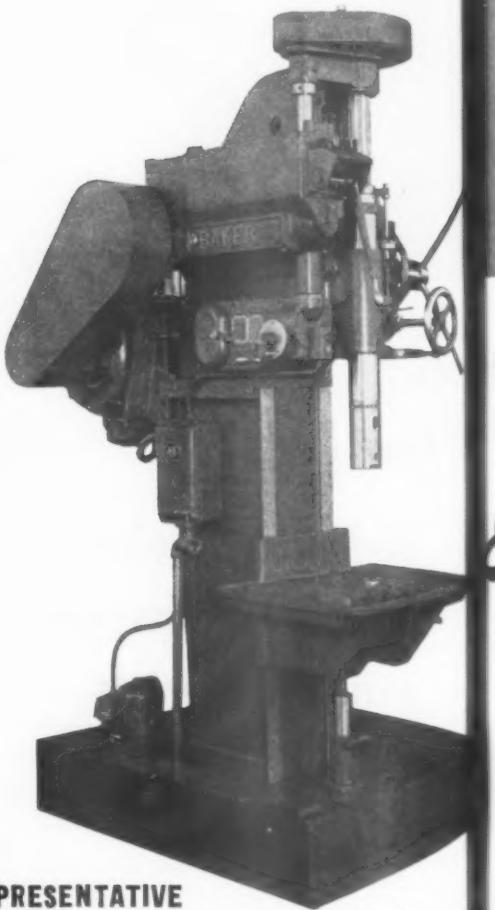
... OFFERS YOU
HIGH CAPACITY DRILLING
PERFORMANCE with the NEW

MODEL No. 150 HEAVY DUTY DRILLING MACHINE UNIVERSAL QUICK CHANGE TYPE



... SPEEDY
... VERSATILE
... EFFICIENT

A new BAKER-built unit — the Model No. 150 Heavy Duty Drilling Machine—has been specifically designed to supplant the proved and satisfactory Model No. 121. It has wider speed and feed ranges, and as standard Electrical Equipment furnished with reversing Controller allowing for tapping using solid taps. Spindle reversed through Push Button placed convenient to operator.



MODEL 314A → UNIVERSAL QUICK CHANGE TYPE HEAVY DUTY DRILL

CAPACITY: Machine has ample capacity to drive three inch diameter High Speed twist drills, to the limit of their efficiency in steel. Machine also adapted to boring, counterboring, facing, forming and tapping operations.

WRITE FOR OUR NEW CIRCULAR OR CONTACT OUR NEAREST REPRESENTATIVE

Atlanta—Chandler Machinery Co.
Birmingham—McVey-Hausman Co.
Boston—Stedfast & Roulston, Inc.
Buffalo—George Keller Machinery Co.
Chicago—Marshall & Huchart Machinery Co.
Cincinnati—Motch & Merryweather Machinery Co.

Cleveland—Motch & Merryweather Machinery Co.
Detroit—Motch & Merryweather Machinery Co.
Houston—Sam H. Penny
Los Angeles—Machinery Sales Company
Montreal—F. F. Barber Machinery Co.
New Orleans—Jos. F. Dehan

New York City—VanDyck Churchill Company
Philadelphia—Swind Machinery Co.
Pittsburgh—Motch & Merryweather Machinery Co.
Rochester—George Keller Machinery Co.
St. Louis—Robt. R. Stephens Machinery Co.

St. Paul—Robinson, Cary & Sands Co.
San Francisco—Harren, Rickard & McCone Co.
Seattle—Buckner-Weatherby Co., Inc.
Syracuse—J. F. Owens Machinery Co.
Toronto—F. F. Barber Machinery Co.
Walkerville, Ontario, Canada—F. F. Barber Machinery Co.

BAKER BROTHERS INC. Toledo, Ohio, U.S.A.

DRILLING

BORING

TAPPING

CONTOUR GRINDING MACHINES



OVER 50 YEARS
EXPERIENCE

CORRECT TENSION

CONCENTRICITY

SPECIAL STEEL
CONTROLLED HEAT TREATMENT

GROUND AFTER HARDENING
POWER SPRING

SURE-GRIP SERRATIONS

HARDINGE

Engineered COLLETS and FEED FINGERS
for Automatics, Chucking Machines and Turret Lathes

OVER 50 YEARS EXPERIENCE provides us with a thorough understanding of all requirements and conditions.

CONCENTRICITY—Special finishing methods assure essential accuracy.

POWER SPRING for quick collet opening.

SURE-GRIP SERRATIONS for maximum grip on bar stock with minimum machine pressure.

CORRECT TENSION—Testing devices guarantee correct tension for each particular hole size.

SPECIAL STEEL for each distinct requirement.

CONTROLLED HEAT TREATMENT means power spring for collets, correct tension for feed fingers and durability for both.

GROUND AFTER HARDENING to assure uniform dimensions.

HARDINGE Collets are also available for all makes of lathes and milling machines.

HARDINGE BROTHERS, Inc., ELMIRA, N. Y.

"**PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE**"

The Sunnen Precision Honing Machine
will help you to

CONSERVE VITAL WAR MATERIALS



★ The greater accuracy of the Sunnen Precision Honing Machine assures fewer rejects — conserving not only vital war materials but precious man-hours of labor as well.

Since the Sunnen Precision Honing Machine is usually used to perform the last operation, its super-smooth finish and accuracy make possible absolute interchangeability of parts — another time and money saving feature.

Consider These War Production Advantages!

Skilled labor is not necessary! Operators, even girls in 'teens, can be trained in a few hours to handle jobs in "tenths."

The Sunnen Precision Honing Machine is low in cost — economical to operate.

Relieves big internal grinders for other important jobs.

Wide range — handles internal cylindrical surfaces from .185" to 2.400" in diameter. No jigs or fixtures — work is held in hands.

Accuracy within .0001" guaranteed.

Put Sunnen Honing to work in your plant!

Write for complete information — or we'll gladly have a Sunnen engineer call and show you what the Sunnen Precision Honing Machine can do on your job in your plant.

SUNNEN PRODUCTS CO., 7932 Manchester Ave., St. Louis, Mo.
Canadian Factory: Chatham, Ontario

SUNNEN



Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."



Aircraft Valve Tappet Roller. 4-Micro finish.



Drill Jig Bushing "Increases sales appeal of product."



Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.



Inner Bearing Ring "Accurately removes last 'tenths' at stock."



Aluminum Aircraft Link "produces high finish without bell-mouthing."



Drawing and Blanking Die "Saves time in producing smooth base metal finish."



"Strict alignment maintained between two holes."



Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.



Saved time in producing a smooth, accurate finish on this bronze remote control valve body.



Cones for Wheel Balancing Machine "Accurately aligns two interrupted surfaces."

FOR FASTER, BETTER MILLING

A "HYPER-MILL"



ANOTHER  INSTALLATION

A NEW DESIGN AND AN IMPROVED CARBIDE

that . . .

Perform at extraordinarily high cutting speeds;
Permit the milling of heat-treated alloy steels;
Produce highly burnished surfaces;
Result in a high production rate.

The new design and the improved carbide are described in our "Hyper-Milling" Bulletin FE-106, which is yours for the asking.

Firth-Sterling
STEEL COMPANY

Offices: McKEESPORT, PA. - NEW YORK - HARTFORD - PHILADELPHIA
CLEVELAND - DAYTON - DETROIT - CHICAGO - LOS ANGELES

new
Use
**Tungsten-Titanium
Carbide**

The selection of Firthite Tungsten-Titanium Carbide for milling and almost all other **STEEL-CUTTING** operations avoids the use of Tantalum—a "scarce" and "critical" material.



FIRTHITE

THE "HYPER-MILLING" CARBIDE



M
U
R
C
H
E
Y

Threading tools THAT INSURE HIGH PRODUCTION



← TYPE "M" COLLAPSIBLE TAP

With all working mechanism fully enclosed for protection against chips and dirt, this collapsible machine tap is of a new design for tapping straight threads. It can be furnished with the handle as a non-rotating tap on turret lathes and hand screw machines or, as a rotating tap on drill presses and tapping machines.

TYPE "G" SELF-OPENING DIE HEAD →

This non-rotating, self opening die head has been designed to be used on hand screw machines or automatic machines where the die head does not revolve. All parts are hardened and ground and the die head is of the pull-off type, being opened by self-contained trips which are actuated by retarding the forward movement of the die spindle at any point. Head is closed automatically by lateral movement when closing handle engages a stop on the machine or by hand.



← TYPE "C-O" SELF-OPENING DIE HEAD

Designed to be used on any machine where the die head is revolved, this type of die head features ruggedness of construction and is compact with few parts. Therefore it does not lose size and frequent adjustments are not necessary. Chasers in these "C-O" heads are backed up with solid bearings which do not require cams for operation, thus eliminating resultant tapered threads. Sizes range from $7/16"$ up to and including $4"$.

For complete information on these Threading Tools, write

MURCHEY MACHINE & TOOL CO.

DETROIT • MICHIGAN

Two Advantages



IN HAVING
DETROIT BROACH
DESIGN AND BUILD
YOUR BROACHES

Performance
Guaranteed

Faster
Delivery

The Engineering Department of the Detroit Broach Company is composed of men who are thoroughly familiar with every phase of broaching. They know that a broach, more than any other tool, must be correctly designed in the first place or no amount of adjustment can make it produce properly. Any broach and fixture designed and manufactured by the Detroit Broach Company is guaranteed to do the job exactly as required.

When your broaches and fixtures are designed at Detroit Broach, delivery is expedited considerably. Delivery dates are determined by the date of placement of the order. Delivery time is the same for designing and manufacturing as it is for manufacturing alone. Consequently your time required for designing is completely saved . . . often a matter of weeks in these strenuous times.

Take full advantage of Detroit Broach's experience and facilities. Let Detroit Broach engineers carry full responsibility for your broaching operations.

DETROIT BROACH COMPANY
20201 SHERWOOD AVENUE • DETROIT, MICHIGAN



Periodic Lubrication, SIMPLE MAINTENANCE, KEEP CP HICYCLE GRINDERS IN CONTINUOUS SERVICE

*Cool-running,
Long-service Tools
assured by Four
Precautions*

CP Hicycle Electric Grinders have long been known for their low maintenance costs — lowest of any type of portable tool. But, even CP Hicycles will give better service, with minimum of repair time if they are given ordinary care.

Here are four simple suggestions which will help you keep Hicycle Grinders in continuous service. Do these things regularly and you will cut repair time to the minimum and conserve strategic materials.

While these illustrations show a CP grinder, the suggestions are applicable to most CP Hicycle Electric Tools. Detailed recommendations on other CP Hicycle and Universal Electric Tools will be given in future advertisements. Watch for them.

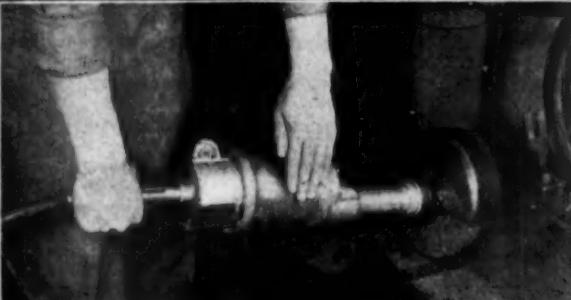
1 **Keep oil gear case once a month and fill with grease two-thirds full. Too much will cause churning action and get into motor.**



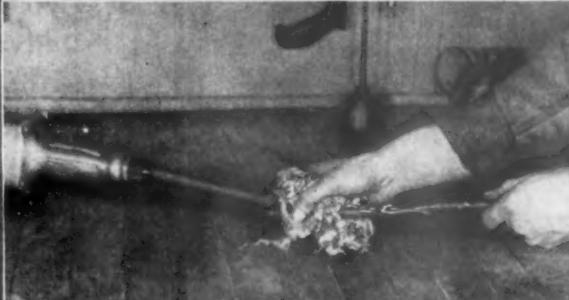
2 **Keep the ventilation openings free of dirt. Once a month — more frequently under dusty conditions — blow out openings with air hose.**



3 **A hot tool indicates overgreasing or too much grease or too little grease. Check temperature of housing by touching it frequently.**



4 **A good precaution with all electric tools. Always keep rubber cables free of grease and oil, otherwise they will swell and rot.**



★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL COMPANY

General Offices: 8 East 44th Street, New York, N. Y.

★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES

CAN YOU CUT Pressure Tight Threads
WITH YOUR DIE HEADS?

*This One
Does!*



If you've worked to the new threading specifications for PRESSURE TIGHT pipe fittings (used by the Army and Navy for S.A.E. fuel lines, hydraulic oils, refrigerants) your inspectors know that meeting the usual precision limits of American Pipe Threading Standards is easy, by comparison.

Plants that specialize in millions of these closer limit fittings also specialize in Namco Self Opening Dies with circular ground thread chasers because:

- ✓ 1. Circular chasers are ground exactly to the closest tolerances required — gauge accuracy;
- ✓ 2. When Namco die heads open at end of the cut, the chaser holding blocks drop smoothly off from positive cams — no drag, no shave, no tell-tale marks;
- ✓ 3. The closest gauges used for checking pitch, lead, form and taper, prove that these tools will meet and hold not part but ALL of these essentials — on long production runs.

If you have pressure tight threads to cut, or any other out-of-the-ordinary threading problems, put it up to Namco Circular Chaser Dies.

Catalog D-42 explains "why" in detail.

BRASS

MONEL

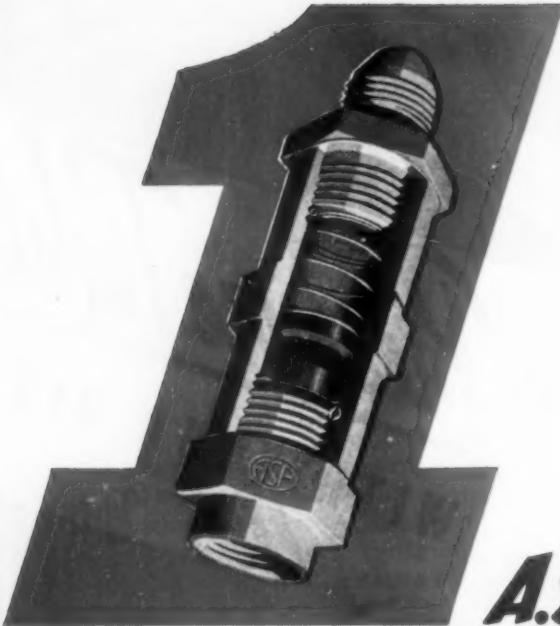
FORGING

ALUMINUM

NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES
AND TEST, GAUGE, MACHINE, DRILLING, THE SUBDIVISION, LIMIT SWITCHED, GAGING, DENTICULAR, CONTRACT MANUFACTURING



A.S.P. Valve for Any Connection in Either Direction

16% less weight—less inventory stock—less lost time—no production tie-up—when A.S.P. Universal Interchangeable Check valves are used in Airplane Hydraulic lines.

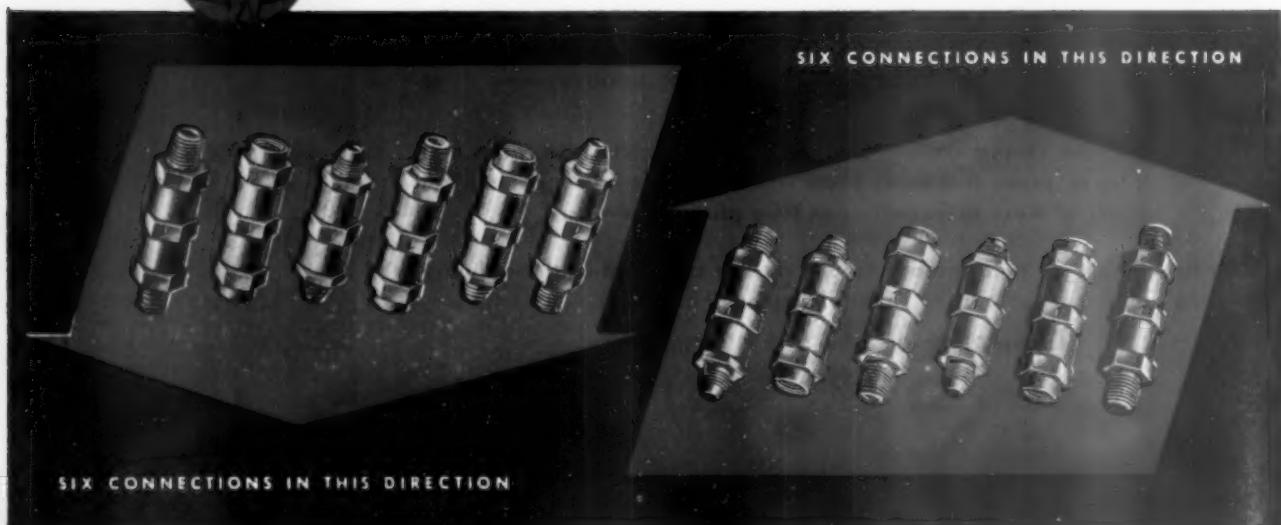
One standard body of heat treated aluminum alloy with two of three types of adapters provides for immediate connections with flared tubing or internal or external pipe threads—both ends alike or both different.

Large ported phenolic seating at either end of Valve body for reversal of fluid flow direction. Flow increased two to four times with corresponding reduction of back pressure. Laboratory tested to 50,000 reciprocations and 275° F. with no distortion or failure. Unaffected by vibration, variable pressures or acceleration. Positive control insured on critical lines. Made in standard tubing sizes.

Send for new Bulletin.



AMERICAN SCREW PRODUCTS
LOS ANGELES • CALIFORNIA



HOW TO MILL STEEL, CAST IRON AND ALUMINUM... *on One Machine!*

AMPLE FEEDS AND SPINDLE SPEEDS ON SUNDSTRAND
RIGIDMILS ACCOMMODATE ALL THREE METALS



Your milling jobs in different metals can be done easily on Sundstrand Rigidmils. In addition, you can tool them up for production milling. With a vertical spindle attached head (extra equipment), the Rigidmil handles practically all types of milling operations in all metals.

74 SPINDLE SPEEDS IN 60 TO 1 RATIO
The high ratio spindle heads of Sundstrand Number 1 Rigidmils provide either one of two large speed ranges. The Type A has spindle speeds from 20 r.p.m. to 1200 r.p.m., Type B from 40 to 2400 r.p.m., both with 60 to 1 ratio and 74 possible speed changes. Here are speeds for every milling job in any metal for all cutter sizes within range of the machine.

INFINITELY ADJUSTABLE HYDRAULIC FEEDS

The wide range of hydraulic feeds, to-

gether with the large spindle speed range, permit adjustment for best possible cutting conditions and maximum production, regardless of metal being machined.

FOR SHORT OR LONG-RUN MILLING JOBS

The high rapid traverse and quick acting controls of Rigidmils reduce non-productive time between cuts. Furthermore, unskilled help can consistently produce work at close limits, as the operator merely changes work pieces and starts automatic cycle.

The simplicity of feed and speed adjustments—the ease of set-up and changeover—enable Sundstrand Rigidmils to offer similar production advantages on short-run work.

AUTOMATIC TABLE CYCLES

A variety of machining cycles, accurately controlled by easily adjusted dogs, are available on Sundstrand No. 1 Rigidmils.

MAXIMUM PRODUCTION . . . CONSULT SUNDSTRAND ENGINEERS



Sundstrand engineers are available to make recommendations on productive machining. Having wide experience in milling and turning makes it possible for them to suggest changes which increase production...lower cost. Use this service freely. Send complete information with inquiry.

GET THIS FREE MILLING DATA
All cycles and important information on Sundstrand No. 1 Rigidmil are contained in this bulletin. Ask for Bulletin No. 810.



(Above) Sundstrand No. 1 Rigidmil straddle milling cast iron.

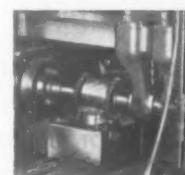
3 TYPICAL JOBS . . .

Illustrated below are three widely different jobs as performed on a Sundstrand Number 1 Rigidmil.



STEEL

Straddle milling at 25 r.p.m. and 52 surface feet per minute.



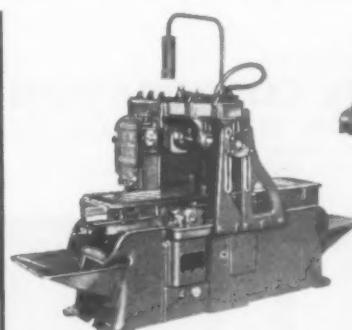
CAST IRON

Milling face and straddle milling lugs at 104 r.p.m. and 100 surface feet per minute.



ALUMINUM

Slab milling base and straddle milling sides at 1200 r.p.m. and 1180 surface feet a min.



SUNDSTRAND FLUID SCREW RIGIDMILS . . . AVAILABLE IN 3 MODELS



SUNDSTRAND AUTOMATIC STUB LATHE . . . AVAILABLE IN 3 SIZES



SUNDSTRAND RIGIDMILS . . . AVAILABLE IN 3 SIZES

SUNDSTRAND MACHINE TOOL CO.

2532 ELEVENTH ST. ROCKFORD, ILLINOIS U.S.A.



"Here's a Tip THAT WILL INCREASE YOUR PRODUCTION!"

THE real "business end" of a carbide tool is the little Carbide Blank. The production you obtain depends entirely upon the cutting ability of this vital carbide.

TECO Carbides are manufactured to rigidly controlled standards of hardness, density and uniformity. Wear and breakage are reduced to a minimum—greatly extending tool life, increasing production and reducing time-outs for tool changes.

The superior cutting qualities of Teco Carbides are available in Tools and Blanks in all grades, sizes and styles for practically every machining need.

TUNGSTEN ELECTRIC CORPORATION
570 39TH STREET, UNION CITY, NEW JERSEY
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Representative: Architects & Builders Bldg., Indianapolis, Ind.

TECO CARBIDES

...cut at higher speeds

...hold cutting edges longer

...produce more pieces between grinds

...reduce grinding and re-tooling time

Write for your copy of the
NEW TECO CATALOG

Illustrates and gives specifications of all standard TECO Carbide Tools and Blanks for turning, boring, facing and cut-off operations.

TECO Pioneers in Tungsten Carbides
for over a Quarter Century **CARBIDE TOOLS**

"I am an
**AUTOMATIC
MACHINIST**"

"I do this work
within 0.001 inch"

Get this **AUTOMATIC,**
ERROR-PROOF OPERATOR and get
7 TIMES MORE PRODUCTION from
your present standard tool room tools.

A DUPLIMATIC will automatically turn one, or two, or three feed screws of almost any machine tool, automatically, simultaneously! It will permit almost any standard machine tool to be converted over to mass production contour machining at accuracies that will astonish you.

It is uncannily human, yet it operates with absolute certainty.

No human operator could possibly turn the two feeds on this vertical lathe to form-turn this ordnance part at required speeds of production and at the limits demanded. Yet DUPLIMATIC does it easily, accurately and at speeds that exceed the original specification.

DUPLIMATIC "FITS" ANY MACHINE
DUPLIMATIC Single, Dual or the three dimensional

"Special"—can be quickly connected up with any standard tool room tool. A few hours to connect the drive heads to the feed screws; a few more to show the operator how simple DUPLIMATIC is to handle and *mass production at tool room limits has started!* An average of 7 times more production than with manual operation alone is the well-established record of DUPLIMATIC.

WHO USES DUPLIMATIC? The biggest producers of war goods use DUPLIMATIC: Pontiac, Cadillac, Chevrolet, Chrysler, DeSoto, Pullman and Pressed Steel Car, A. O. Smith—to mention just a few.

When your Pet Machinist gets drafted . . .
draft DUPLIMATIC

Send for complete
details NOW!

DUPLIMATIC
and your present tool room tools
will do more contour machining
faster, more accurately and with
less skilled help.

DETROIT UNIVERSAL DUPLICATOR CO.

731 E. Milwaukee Ave.

Detroit, Michigan

"LOGAN" HYDRAULIC EQUIPMENT



The headstock of this Sparks Hydra-Feed Standard Lathe, manufactured by the Sparks Machine Tool Corporation of Norwalk, Conn., is equipped with a "LOGAN" Model "HR" Hydraulic Cylinder for the actuation of a "LOGAN" Expanding Mandrel. "LOGAN" Model "HR" double acting, rotating type Hydraulic Cylinders are designed for efficient operation of chucks, mandrels and other work holding devices required

to be mounted on rotating spindles. The many exclusive features of the "LOGAN" Rotating Type Hydraulic Cylinders assure continuous service without maintenance expense. A "LOGAN" 3-Jaw Expanding Mandrel holds the work securely in place during the work operation. This "LOGAN" Hydraulic Equipment provides rapid, positive action and rigid support of the work. Let "LOGAN" Representatives and "LOGAN" Engineers make recommendations on your air and hydraulic problems.

LOGANSPORT MACHINE, INCORPORATED

902 PAYSON ROAD

LOGANSPORT, INDIANA

* MANUFACTURERS OF AIR
AND HYDRAULIC DEVICES,
CHUCKS, CYLINDERS, VALVES,
PRESSES AND ACCESSORIES *



MODEL M-H-2

INTERNAL GRINDER

With Both
POWER and HAND FEED

One easy move of lever gives operator the choice of either hand or power feed, and neither one is dependent on the other . . . this permits top speed power grinding for diameter, and an instant switch-over to hand operation for close decimal depth grinding when desired . . . finishes the job with one set-up in place of two, and eliminates possibility of "run-outs" . . . one Sav-way model MH2 actually will do the work which formerly required two machines to do.

Send for "Bulletin MH2" which gives complete specifications.

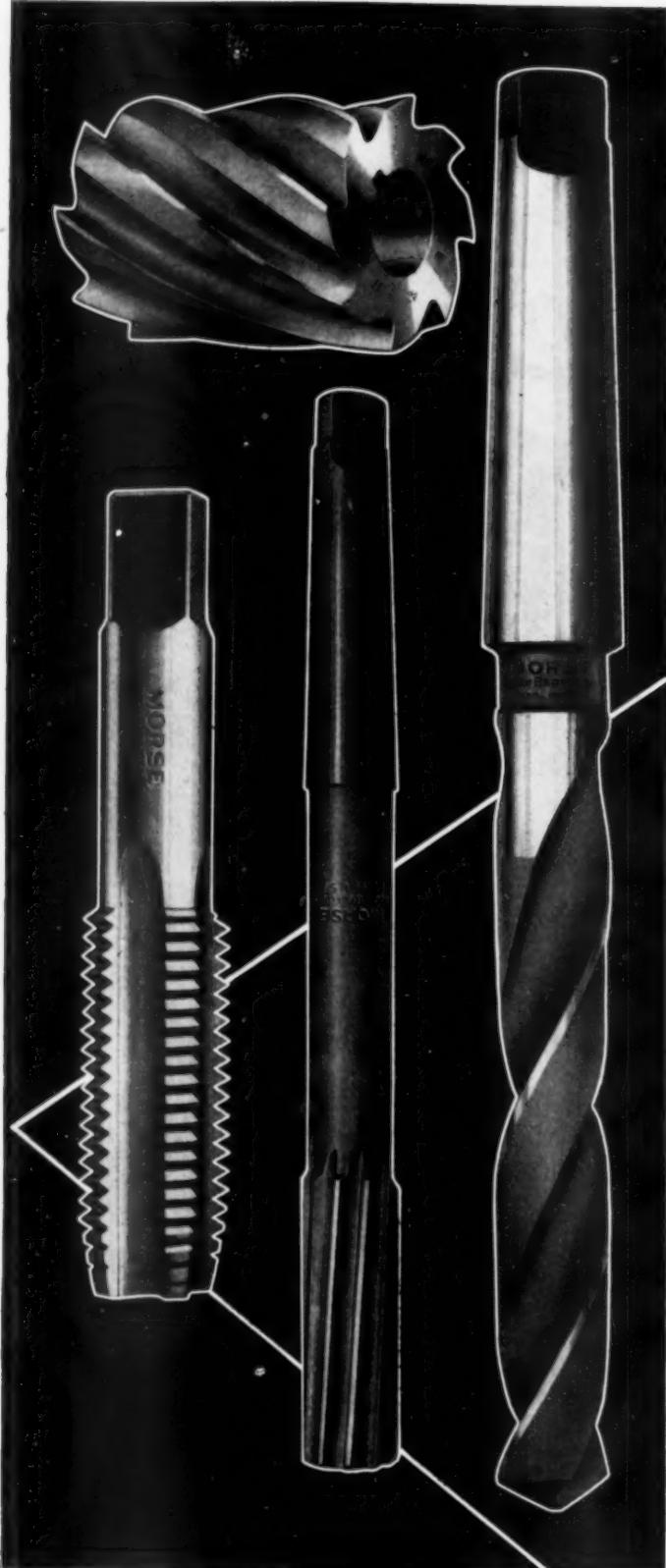


Shift lever pushed in and feed engaged for operation of machine manually; power feed is now disengaged.



Shift lever pulled out and feed engaged for operation of machine by power; hand feed is now disengaged.

Sav-way INDUSTRIES
Machine Tool Division
4879 EAST EIGHT MILE • DETROIT, MICHIGAN



PRODUCTION STRATEGY

- It is good strategy to use good cutting tools. The quality of your cutting tools measures the efficiency of your machine tools!

Ship worn-out High Speed Tools back to the steel mills — this high grade steel can do another war job.

MORSE

THERE IS A
DIFFERENCE

**TWIST DRILL AND
MACHINE COMPANY**
NEW BEDFORD, MASS., U.S.A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.

ERNSTEDT MANUFACTURING INSTALLS MODEL A
LEVELAND *Single Spindle* AUTOMATICS
TO PRODUCE SMALL LOTS, SHORT RUNS OF PARTS

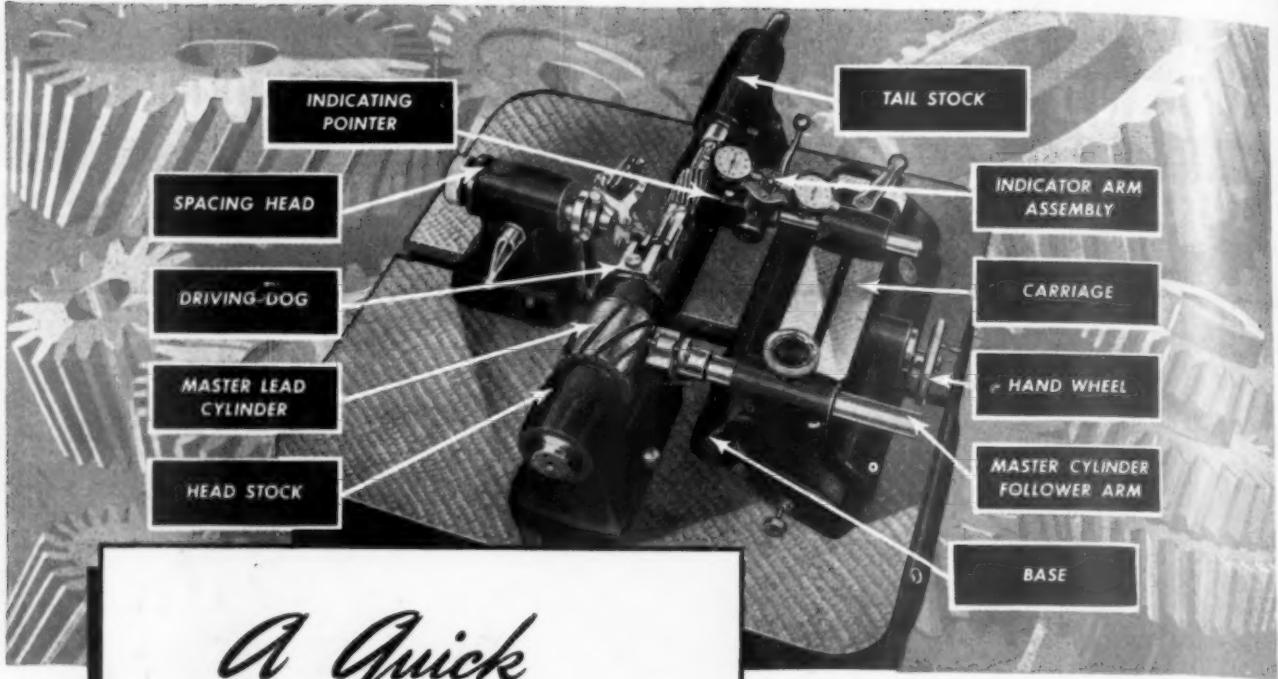


For production operations at Ternstedt Manufacturing involves producing *small lots and short runs* of many parts—variously and rapidly. For many of these jobs Ternstedt has called Model A, Cleveland Single Spindle Automatics, a suitable answer to many production problems. Easy to tool and provided with universal camming and variable tool drive, Model A Clevelands are built in sizes from 1½-inch to 2½-inch capacity with constant speed drive as standard; two-speed drive optional at extra cost. In 3¾-inch to 6-inch capacity, Model A has four speed motor drive, standard. Ask for information on the size of interest to you.

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Offices: Chicago: 20 N. Wacker Drive, Civic Opera Bldg., Room 1408
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CLEVELAND
Single Spindle
AUTOMATICS

MODEL A—Built in 1½-inch to 9½-inch capacities inclusive
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*A Quick
Simple Method*
**OF CHECKING
GEAR DIMENSIONS**



The RED RING Universal Gear Checker checks the dimensions of spur and helical gears to discover errors in index, helix angle and tooth size, eccentricity, interference and wobble — also errors in the lead of helical gears.

The lead of helical gears is checked against a master lead groove in a hardened and ground master lead cylinder. This cylinder may have as many as ten different grooves to check as many leads.

The design of this equipment is so ingeniously simple that it does not require a skilled mechanic to operate it. Typical small gears may be checked by the average shop man at the rate of 1 per minute.

Three sizes of Gear Checkers are available to accommodate gears up to 12", 18" and 24" O.D.

Write for special bulletin on Gear Checking.

SPECIALISTS ON SPUR AND HELICAL
INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORMS

**NATIONAL BROACH
AND MACHINE CO.**
RED RING PRODUCTS
5600 ST. JEAN • DETROIT, MICH.

(Left) Two views of Pump Cylinder, showing the 14 Angular Piston Holes which are rough and finish bored on the Stokerunit Simplex Precision Boring Machine. Holes alternate directionally at 18° angles.



(Right) Two holes are bored simultaneously, work being indexed manually to next set of holes in same angular direction. Work pieces are then transposed in fixtures to bore alternate holes.

(Below) Accuracy and finish maintained in production by girl operator.



WRITE TODAY for these two booklets covering our entire line of Simplex Precision Boring Machines. Complete data and specifications are included.

14 ANGULAR PISTON HOLES IN PUMP CYLINDER

Rough and Finish Bored
on Two-Spindle

STOKERUNIT SIMPLEX

Precision

BORING MACHINE

The 14 angular piston holes in this pump cylinder alternate directionally at 18° angles. To insure the required accuracy in radial location, angles and diameter, precision boring equipment with proper fixtures is indispensable.

On this job, No. 1 Stokerunit Simplex Precision Boring Machines with two spindles are maintaining close tolerances in all dimensions. Diameter of the rough bore is .3594" and is held to $\pm .001"$ with a stock removal of .020"- .025". On the finishing operation, the diameter of the bore is .4053" and is held to $\pm .00015"$ with a stock removal of .012"- .015"; high finish is assured. Radial location is held to within .003" on both operations. Length of bore 1".

Actual boring time on both operations is 20 seconds per hole, two holes being bored simultaneously as shown in upper illustration at left. Feed is 3" per minute; speed 1750 r.p.m. Stock is 50,000 tensile iron.

OVER 25 MODELS of Stokerunit Simplex Precision Boring Machines are available in both mechanical and hydraulic feeds, with single or multiple spindles, for either short-run or production work. Among them you may find the model which will meet your precision boring problems.

Get the complete Stokerunit story now. For specific recommendations, send blueprints of parts with your production problems. There is no obligation.

STOKERUNIT CORPORATION
SIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES
4528 WEST MITCHELL STREET • MILWAUKEE, WISCONSIN

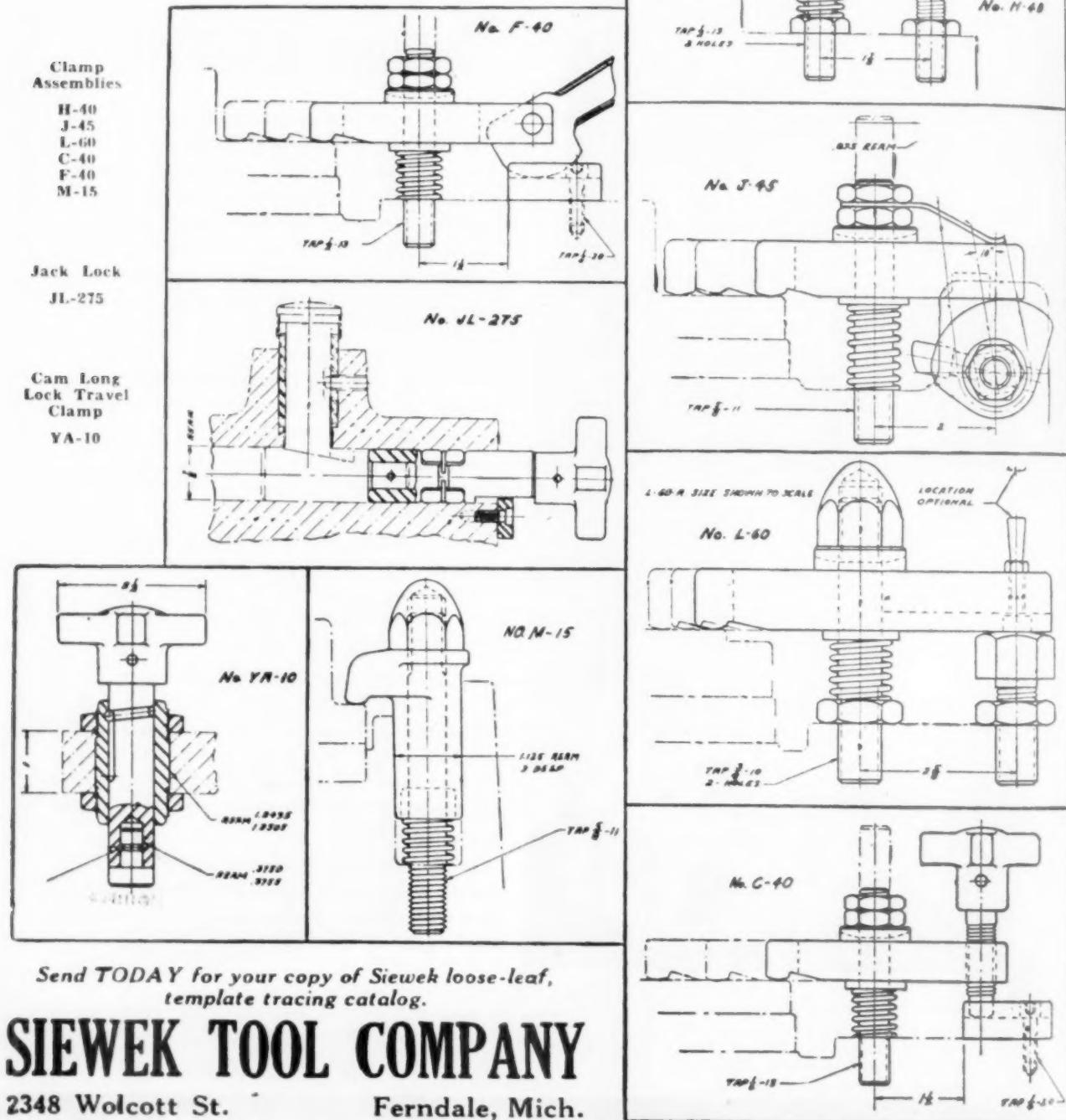
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Save 50% Designing Time and Many Man-Hours in Construction

HOW TIME IS SAVED:

- (1) Check your assembly drawings, note details
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- (3) Remove sheets with details selected, insert under layout and trace, show location and size of necessary holes
- (4) Mark detail with Siewek Catalog number

Clamps, Cams, Washers, Nuts, Clamp Rests and Hinge Pins are hardened. Studs are alloy steel heat treated.



A wide range of clamps, washers, cams and locks are maintained in stock. We also make up special details to order

Send TODAY for your copy of Siewek loose-leaf, template tracing catalog.

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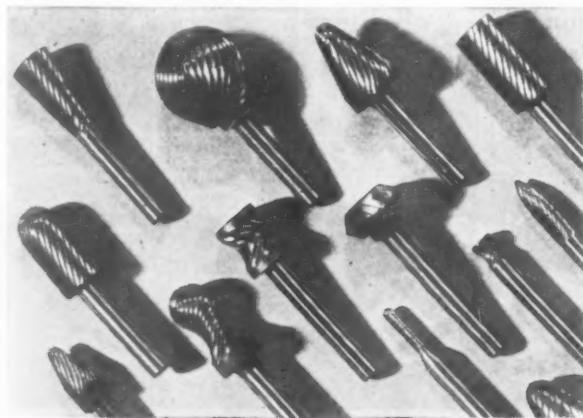


WHICH DOES THE BETTER REGRINDING JOB — MAN OR MACHINE?

Whether your dull cutters can be better reground by machine or by skilled craftsmen depends entirely upon the type of cutter—and the arrangement of its flutes. Here at Severance Tool we regrind thousands of cutters each day—some by machine and some by hand. Regardless of the type of tools you send us, we are manned and equipped to regrind them by the method that does the

job best. After regrinding we further improve your tools by the new Severite heat-treat process which hardens the teeth of your cutters and increases their life from two to five times.

Severance Regrinding Service, 1) Saves tool steel by making worn cutters as good as new, 2) Saves your production time by returning your renewed tools within 72 hours of the time they are received, and 3) Saves money because Severance regrinding costs only a fraction of original new tool price. Write today for "Regrind Toollog" fully describing our regrinding service.



Severance

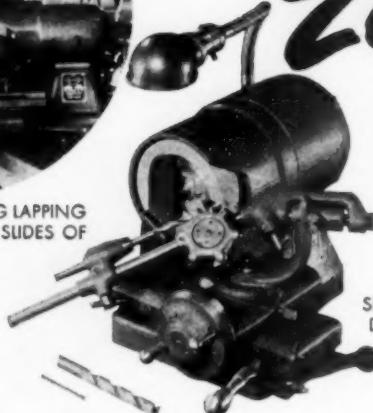
MIDGET MILLING CUTTERS • PRECISION REGRINDING
SEVERANCE TOOL INDUSTRIES, INC., SAGINAW, MICH. •
PLANTS IN LONG ISLAND CITY, N.Y.; DETROIT, MICH.;
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See Severance Display in Booth 65 at Machine and Tool Progress Exhibition in Milwaukee, Wisconsin Auditorium March 25, 26 and 27.

Simplified Assembly



ISABELLE DOWLING LAPING AND ADJUSTING SIDES OF 1-G GRINDER.



Ease of Operation

SIMPLICITY ITSELF!

1. INSERT DRILL



2. A QUARTER-TURN OF THE RIGHT HAND CHUCKS IT SECURELY



3. MOVE TO GRINDER POSITION



4. GRIND THE SCIENTIFICALLY CORRECT SELLERS POINT



★ The employment of girls to release manpower for our growing Armed Forces is a new experience for the 94-year-old firm of Wm. Sellers & Co. Only the vital need of the hour could have brought about such a radical change. Yet one of the things that contributed was the very simplicity of Sellers design. That which has been responsible for the precision and ease of operation of Sellers Drill Grinders is making it possible for these young women to assemble these machines with the same accuracy and reliability as the men they have patriotically released for War Service. This same simplicity, combined with precision and ease of operation, is making drill-grinding by girls and other relatively unskilled operators a speedy, accurate job in thousands of factories everywhere.

WILLIAM SELLERS & CO., INC., Philadelphia, Pa.

Sellers





For FACTS about MULTIPLE THREAD MILLING CUTTERS . . .

THIS new book contains a great deal of useful and practical information for anyone who works with multiple thread mills. It was written by men with long experience in this specialized field and is as complete as it is authoritative.

The book contains: descriptions and illustrations of the various types of thread mills, important design considerations, methods of use and how to avoid trouble, tolerances in manufacturing ground and unground thread mills, and

Why look over the other fellow's shoulder?

methods for proper sharpening. With great numbers of multiple thread mills now in use for war production, it is important that this information be in the hands of those responsible for getting the most out of these tools.

This book should serve to clarify many problems which have arisen under war conditions. Not the least of these is the proper specification of thread mills to assure promptest delivery, and the proper methods of sharpening to assure longest life.

Get a copy of this NEW BOOK for yourself . . .

We have already given this book wide distribution, through our mailing list, and you may have seen it "over the other fellow's shoulder." If you want a copy of your own, please write us on your company letterhead, and we will send you one promptly. If you should want to order a quantity, such as for training purposes, there will be a small charge per copy.



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GENERAL OFFICES AND PLANT • 213 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

Until Victory—

Today—and until Victory—Ceco Automatic Universal Precision Screw Machines are turning out a wide variety of small, accurately finished parts for famed makers of aircraft and other military precision instruments, controls and accessories. So it is that Ceco Automatics are proudly helping to pro-

duce, economically and at high speed, the extremely accurate precision parts for instruments which give sight, sound or slugging power to America's brave and avenging young sky fighters. And until Victory is won, we would not have it otherwise. Nor would you.

After Victory—

Ceco Automatics will serve the makers of instruments, controls, appliances and devices which will bring to a post war world a new era of comfort and efficiency.



CECO'S OUTSTANDING ADVANTAGES

EXTREME ACCURACY. Ceco holds tolerances to .0003".

PROVED ECONOMY. In many cases Ceco produces a finished piece from bar stock without a second operation for finish and tolerance.

HIGH SPEED. Ceco has a Master Speed Ranger which gives from 680 to 7500 R.P.M. spindle speed by the turn of a handwheel. No changing gears, belts or pulleys. Ceco's Cam Shaft has a range of from 3 seconds to 8 minutes. No gears to change.

SIMPLICITY. Ceco's Precision Roller Bearing Spindle is always in adjustment. Operates at faster speed and runs cool at high speed. Ceco's Constant Rise feeding mechanism gives more accurate feeding.



CECO

SWISS TYPE

Automatic

UNIVERSAL PRECISION SCREW MACHINES

Engineered and Manufactured by
THE CITY ENGINEERING COMPANY
Dayton, Ohio

Since 1909, Designers and Builders
of Tools, Dies, Fixtures
and Special Purpose Machinery.

STELLITE HIGH-PRODUCTION CUTTING TOOLS are Available for Prompt Delivery

Stellite "98M2" and "Star-J-Metal" tools are widely used for machining steel, cast iron, and most of the machinable materials. These dependable tools take heavy cuts at high speeds and heavy feeds—with long life between grinds. This means high production at low cost per piece machined.

The types and sizes in which each grade is available, the purposes for which each type is recommended, and the correct grinding wheels to use are shown in the descriptive price lists illustrated below. Copies of any of these price lists will be sent on request.



Stellite "98M2" tools (left) were developed specifically for machining steel, and are also excellent tools for use on brass, bronze, and cast iron. They are hard, tough, and possess good edge strength.

Stellite Star-J-Metal Tools (right) are used on many materials, including steel and cast iron, for a wide variety of operations—including turning, boring, facing, milling, reaming, grooving and forming.



Standard Tools in Stock

SOLID TOOL BITS—Square, flat, or round . . . wide range of sizes . . . finish-ground ready for use in standard tool holders. Easily converted to various profiles.

WELDED TIP TOOLS—A variety of styles and sizes for use where solid bits are impracticable.

MILLING CUTTER BLADES—For many cutter body types, including Ingersoll, Kearney & Trecker, Modern, Production, OK, and Continental.

WEAR STRIPS—Haynes Stellite alloy castings brazed

to a mild steel base, for attachment to boring, driving, and pilot bars to assure accuracy and long life.

Special Tools to Users' Specifications

Many types of special Stellite tools are regularly supplied, cast and finish-ground to users' specifications. These include solid bits, welded tip tools, milling cutter blades, reamer blades, brazed-in blade shell end mills, form tools, boring tools, counterbores, spotfacers, and reamers.



HAYNES STELLITE COMPANY *Unit of Union Carbide and Carbon Corporation*

New York, N. Y.



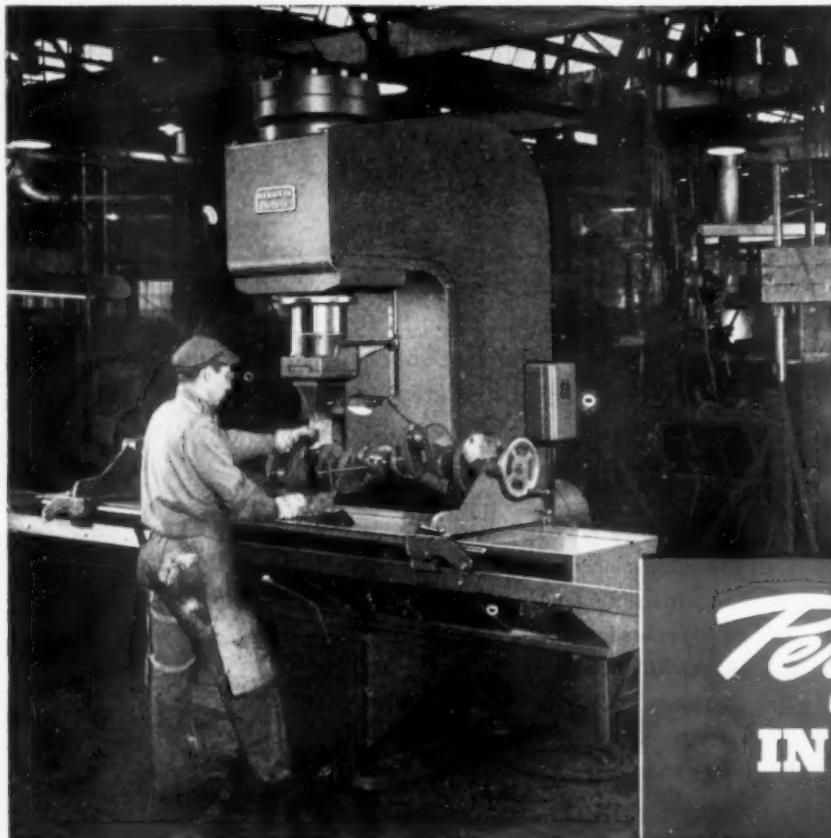
Kokomo, Indiana

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

HIGH-PRODUCTION METAL-CUTTING TOOLS

The words "Haynes Stellite," and "Stellite" are registered trade-marks.

MARCH, 1943



*At a Caterpillar Tractor Co. plant
Hannifin 75-ton hydraulic
straightening press with long
table, long fixture rails,
and center type fixture, for
straightening heavy crankshafts.
Ram stroke is adjustable, to
avoid unnecessary travel in
production operations.*

DEPENDS UPON

Performance
IN THE FIELD

Precision
IN THE SHOP

Many a manufacturing operation, such as this crankshaft straightening job, seems at first glance a long way behind the front lines, until you reflect that the distinguished performance of American equipment all around the world rests upon thousands of such precise details of production.

This precision straightening of heavy crankshafts is made faster, more accurate, easier to handle, by the exclusive sensitive pressure control of Hannifin hydraulic presses. This infinitely variable control of ram pressures delivers anything from a few pounds to full capacity, in proportion to move-

ment of the hand lever or foot pedal control. Because this control is so simple and natural, accurate straightening can be done rapidly and consistently.

Hannifin hydraulic presses are built in a wide range of standard types, capacities 5 tons to 200 tons, for straightening, forming, assembly, and

similar operations. Standard designs can be readily modified to provide the table construction, gap, reach, and ram stroke you need. Write for descriptive bulletins, or consult Hannifin engineers for specific recommendations.

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MANUFACTURING COMPANY
621-631 S. Kolmar Ave., Chicago, Ill.

Detroit Representative: R. A. BEAN, Bayard Building, 4829 Woodward Avenue

Telephone Columbia 4949

H A N N I F I N
Hydraulic PRESSES

PRODUCTION PERSPECTIVES*

LAST-MINUTE NEWS REVIEW OF MASS MANUFACTURING

*T.M. REG. U.S. PAT. OFF.

Production: Arms output rose 14 percent in December, the greatest monthly advance since rearmament started. Gains were made in five major categories: Aircraft up 20 percent; ground ordnance up 25 percent, with tank production showing a marked increase; Navy and Army vessels up 1 percent; merchant ships up 9 percent with a delivery of 108; miscellaneous munitions up 11 percent....December plane output was 5,489, a gain of 667 over the previous month; but Nelson says output was held down by lack of controls and instruments. Aircraft builders say aluminum alloy extrusions and forgings are needed....Aircraft engine bottleneck has been broken by automakers who are now turning out 75 percent of total U.S. volume. Their production now exceeds plane output, and engines are being stored. ...Number One scrap problem is copper....Big jolt last month was authorization of transfer of idle machine tools (See CAPITAL COMMUNIQUE, Page 110).

Machine Tools: Final compilations show the value of 1942 output totaled \$1,321,718,000, an increase of 71.3 percent over the preceding year. Figures totaled in February show December production was 29,300 units, valued at \$131,-929,000. This was a gain of 9.1 percent over November....Market Outlook: Builders are divided into two distinct groups on post war market opinion - one optimistic, the other not....Fighting mad, WPB tool men ask why builders should worry about markets when the war is far from won. Some charge a few producers with slowing down, trying to stretch deliveries. They say orders on hand prove top output must be maintained for many months, that builders need not look for other jobs.

Backlog: Here are figures WPB men cite to show why builders had better stop worrying, keep producing....In January this year \$1,267,000 in broaches were shipped, yet orders totaling \$7,518,000 - fully 6.7 months output - were on hand. Milling cutters valued at \$7,706,000 were shipped the same month, yet orders for 4.3 months production were on hand....Unfilled machine tool orders January 1 totaled \$1,132,570,000. Orders for the month totaled \$97,000,000. Last year's monthly shipments averaged \$110,000,000.

Heavy Machines: \$760,000 worth of broaching units were shipped monthly in 1942. WPB estimates it will take 10 months production to clean up the \$8,000,000 in orders on hand. Last year \$18,000,000 in grinders were shipped monthly. Orders on hand January 1 totaled \$198,091,000. The average 1942 monthly delivery of automatic single spindle screw machines was \$2,844,000. Orders on hand the first of this year totaled \$24,607,000, or 9.9 months production....WPB's machine and tool division says lathe builders had better keep humping. Last year they shipped \$33,000,000 monthly. Orders for all types on hand January 1 totaled \$312,000,000, or 9.9 months output.

Future Markets: Government men trying to get machines into shops needing them most state that in 1939 there were 934,000 machine tools in use in the U. S. Seventy percent were more than 10 years old. The automotive industry held 334,-000 of the total. Yet the auto industry is handling only one-sixth of the total war production and orders are being spread further every month....With machine tool users facing the continual problem of semi-skilled workers, WPB experts predict a tremendous repair and parts replacement market soon....One top WPB tool man is gunning for calamity howlers who tell about cancellations for 4 machines, and overlook the continuous pile-up of orders for their equipment.

Tool Conservation Begins in the Tool Crib

Photographs Courtesy Weatherhead Company, Cleveland, Ohio



1

Before a gage is returned to the storage rack, it is thoroughly checked and inspected, and any adjustments or repairs needed are made or ordered.



2

Felt-lined individual compartments protect the gages from injury and provide a practical visual check on the gage stock.



3

Metal check method of issuing and card record of stock condition, with carefully trained attendant, assure positive control of entire gaging system. This "Tool Crib" is air conditioned.

Well-equipped factories in mass production industries do not select their gages haphazardly or just by chance. Their gaging systems are completely integrated and adapted to their particular requirements. But no matter what a plant's gaging needs, all gaging systems should include at least three fundamental features:

1 Adequate checking and measuring equipment—gages need constant checking for significant wear, damage or tampering.

2 Convenient, safe, systematic storage—poor storage conditions can ruin gages even before they are used once, and a lost or misplaced gage means loss of valuable time as well.

3 A positive accounting method—when new gages are needed, they are usually needed badly, there-

fore proper accounting for every gage at all times avoids disruption of the gaging system through delays in anticipating requirements.

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS
DETROIT PLANT: 5850 Second Boulevard
WAREHOUSES in New York, Chicago and Los Angeles
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TAPS ·· DIES ·· GAGES ·· TWIST DRILLS ·· SCREW PLATES
THE TOOL ENGINEER



ECONOMICS OF TOOL ENGINEERING

An expert tells how to gauge
machine and tool expenditures

A. J. CONN

LA SALLE DESIGNING COMPANY



EVERY FIRM always pays for good engineering, whether or not they receive it. Because all do pay, either on the drawing board or in excessive production costs, it is important to know how to gauge the amount of expenditure that can be made safely and planned good business in determining a tooling or special machine program.

As a rule, in determining engineering expenditures, certain special factors must be considered. Each may influence a final decision and none should be neglected. However, in setting up any engineering budget, the most important factor is quantity and next is quantity in relation to cost.

THERE IS a simple formula for determining, roughly, the amount to be gained by a tooling or special machine program. Multiply the present unit cost by the total amount of production and subtract from this the unit cost that can be achieved by special jigs, fixtures or machines multiplied by the total production. The difference provides a rough basis for estimating the amounts to be expended or saved.

This brief calculation, however, includes only the bare fundamentals and does not show the entire picture. For example, the amount of space that may have been saved by the use of a special machine over present methods has been completely ignored. In addition, economies in trucking, handling, inspection and similar saving which measurably affect cost should all be taken into account. A few actual cases readily prove this point.

On one program 500 units were to be built. Because a number of gear centers were to be held to high accuracy, the tooling appropriation requested by the mechanical department was \$30,000. This meant an outlay of

\$60 per unit for tools and placed an unfair burden on the sales department to obtain that much extra for the unit. It was necessary to replan the entire project. By clever re-engineering, these units were produced with standard tools, which increased the unit cost six dollars but reduced the tooling cost from \$30,000 to \$3,000. The total tooling charge was then figured at \$6,000 because the extra labor involved in using standard tools was directly chargeable to engineering.

The tooling charge of this item might be lowered later by repair units to be made plus the possibility of production beyond the 500 units. But a fair way to figure a basis for tooling expenditures over a period of time would preclude allowances for any capacity beyond the 500 units. A basis of calculation that has been tested successfully demands that all standard machines bought for either cost reduction or production purposes should pay for themselves within five years.

In most industries, all special machines must pay for themselves within two years, or their expense cannot be justified. All minor tooling, such as jigs and fixtures should pay for themselves easily in 12 months or less.

These figures at times must be varied because of production peculiarities, such as in the automobile industry, where body lines change from year to year. Individual cases like these call for special judgment rather than a hard and fast rule.

GOOD JUDGMENT in figuring tooling expenditures was shown by a major firm which decided to build a large product for which their tooling department asked a \$1,500,000 appropriation. Anticipated production over a two year period was 500 units

and the ultimate selling price of the unit was \$4,500. The management asked the tooling department what could be done with the minimum possible tooling, even if much of the work had to be placed in outside job shops. By doing this they cut the tooling cost from \$1,500,000 down to \$200,000. This effected an immediate saving of \$1,300,000.

The saving on tooling alone, on the basis of 500 units, was \$2,600 per unit. Manufacturing cost was increased approximately \$500 per unit but the net saving enabled the firm to economically market a product which might be redesigned within a year or two.

RECENTLY, however, a small manufacturing plant was producing a certain part in 150 man-hours. By an expenditure of some \$15,000 in engineering, this time was cut to 32 hours, which made a net saving of 56,000 man-hours on one order of 500 parts. Figuring on a basis of direct labor alone, this represented a saving of \$56,000 plus man-hours and machine time.

In this instance, specific factors that had to be considered in estimating the entire savings included rent saved on floor space, capital released for other projects, less handling and indirect labor, lower inventory of stock in progress and far tighter control over production of a part in fewer operations. Add to these production advantages a better position in the sales market.

There was an interesting case where one special machine was designed and built to take the place of three horizontal boring bars. Savings in floor space, handling, trucking and reduced direct labor were comparatively small. Chief advantages of the single purpose machine was that it achieved an ac-

curacy not obtainable under the old methods and primary savings had to be thought of in terms of rework saved, lessened scrap loss and increased quality. It was hard to take these factors into the exact accounting of savings but they were real.

SOMETIMES advantages obtained in production improvements may be highly intangible. In the case just cited the morale of the entire plant was badly disturbed because of inability to produce more than one unit every other day. Desired production was two units a day, but a bottleneck existed in the horizontal bars. Improper tooling was keeping them from achieving the speed or the quality to get out the desired production.

Immediately, upon the completion of the new machine, which produced, with one operator and one helper, a unit every one-and-a-half hours, the morale of the entire plant was stimulated. From the floor sweeper on up, every employe felt he was accomplishing something in the war effort.

WHEN thinking in terms of production costs and possible savings, better tooling or special single purpose machines may not be among the first objectives to consider. Today, production engineers must sometimes think first of bringing the product design up to the point where it can be manufactured with the greatest possible speed.

Some manufacturers have changed from sand casting parts to die casting parts where possible, and even from die castings to plastics. Remarkable savings in machine time have been made through the use of plaster mold casting and brass alloys, which has permitted some manufacturers to cast extremely good gears with cast teeth requiring a negligible amount of machining. Gears can be cast in aluminum bronze, which produces a hard gear with high tensile strength.

SOMETHING NEW in the production picture is the widespread use of standard drill units. By the use of these a special machine can be built with parts no longer needed for the special purpose for which they were originally used. Aircraft plants use many machines which are actually special machines in purpose but are made up of standard units. Their cost cannot be figured as a single purpose machine, which would have to be junked at the

completion of its term of usefulness.

With this type of special machine a manufacturer can obtain the performance of a single purpose machine at a cost comparable to a good set of fixtures. For production of many large parts, such as anti-aircraft turrets and spars, an entire special machine can be designed and built for about the same price as a good fixture. This makes it unnecessary to buy up standard machine tools which are not readily available from stock.

PROSPECTING FOR LOWER COSTS

- The most fascinating field in the world today is that realm of gold hidden under the hills of tooling, processing, planning and machining.

There is no one field in the industrial setup that is a better place for finding the real mother lode than that which a good cost conscious production engineer finds when he starts to explore in places where no prospector has been before.

For the possibilities of earning a high return from investments made—yes, even for sheer romance—it is doubtful whether any field can excel that of engineering mass production.

However, many mines have been known to contain gold, but the cost of extracting the gold has been more costly than the value of the metal obtained; for that reason certain precepts are useful if they will easily determine whether the gold gained will be enough to justify the effort and expenditures.

Since appropriations for special tools are often paid for by the government or contractor, the manufacturer can thus cut to a minimum his capital expenditures for standard tools. In line with the continued changes on military and naval aircraft, this type of machine is adjustable and rebuilt with little loss.

AN INTERESTING EXPERIENCE with this type of machine was had in a large plant making aircraft parts approximately 70 feet long which required milling and drilling on both ends. Rather than set up several standard machines that would probably take several months for delivery, they designed and built special machines from standard units at far less cost,

saved the cost of handling from machine to machine and saved about 25 per cent of the floor space. To this couple the fact that the products obtained are more accurate, as the entire operation is complete at one setting.

ESTIMATED FIGURES on a machine of this type are interesting. A machine to mill two large notches in the end of a part 40 feet long and to drill a one-inch hole in each end of this part at one time would cost around \$6,000 to design and build. Comparable machinery of standard types to produce the same part would cost a minimum of \$12,000. The estimated time per subject part on the special machine would not exceed five minutes. Using standard machines the same operation would take 20 minutes.

The amount of saving in direct labor on the production of 160 pieces a day would be 40 hours per day. This would pay for the machine in seven-and-a-half months in direct labor alone. And direct labor is only a minor part of the savings as the reduction in handling, stock on hand or in production and in floor space, would multiply the net savings several times. Since this type of machine is not considered as a capital investment but as a special tool it has extra merit from a tax and financial standpoint.

MANY VARIABLES determine the amount that can be expended for tools when figuring from the payroll and cost saving standpoint. A particularly hard decision is to determine whether a part should be made on a hand screw machine or on an automatic. This simple equation may be used as a guide: Total production multiplied by cost on automatic and set up costs and tool cost, minus total production multiplied by hand screw cost and set-up cost, equals savings.

Another problem that commonly comes up in figuring tools is whether a part to be punched on a punch press should be made singly, two at a time, or four at a time, and whether by hand or automatic feed. This can be determined by multiplying the total production by cost per hundred in the use of a simple die. Then compare the results with the total cost of production on the high speed automatically fed die, and finally balance this against the increased cost of the better die. In each case an accurate time study and evaluation of the cost is wise.

THE END.

THE TOOL ENGINEER

Ford's New Model

TWENTY-FOUR MONTHS' PROGRESS AT THE WILLOW RUN BOMBER PLANT



Ford News Bureau photos

Henry Ford, master of mass production techniques, studies a center wing assembly in a giant 60-foot long fixture at Willow Run. Chatting with the motor genius are, left to right: M. L. Bricker, Harry Bennett and Logan Miller.

TODAY, sprawling, gargantuan Willow Run is virtually complete and producing heavy bombers for flight as well as planes in knocked-down form for shipment to assembly plants. Largest manufacturing unit under one roof, it may win recognition as the outstanding mass production application by the seventy-nine year old pioneer of the assembly line technique. Size has been dictated by the immensity of the product.

Consolidated B-24 is powered by four super-charged 1,250-horse-power Pratt & Whitney air-cooled engines. With a speed in excess of 300 miles per hour, a range of some 3,000 miles with a four ton bomb load, this plane can operate well above 30,000 feet. Its 50-caliber guns mounted in powered turrets give it deadly offensive as well as defensive force.

From the production standpoint, interest is in the plane's size, weight, and number of individual parts. And here, figures become astronomical compared with those in fighter plane manufacture. The ship has a wing spread of 110 feet, six inches. Length

**JEROME S. WILFORD
and
W. A. SCOTTEN**

of the fuselage is 63 feet, four inches; its weight approximately 20 tons.

How many parts? 1,250,000 is the



One year ago, readers of *The Tool Engineer* noted results of 7,000,000 tooling hours at Willow Run. Now, with the public eye focused on Ford output, this second article presents brief studies on Ford production methods. It is edited for busy readers.

closest count to date.

It is known that about 700,000 rivets, including every size used in aircraft, are driven into its framework; but Ford's new Zero Spot Welding is eating into this figure as continuing experiments prove its applicability to certain production jobs.

Because Ford started building bombers from scratch, with the sky the limit on tooling costs, methods were utilized that had been previously denied established aircraft manufacturers whose plants were laid out for low production.

Some of these methods differ so radically from accepted practice that a controversy has waxed hot for months about the ultimate practicability of the motor car production methods. Ford replaced soft dies with steel dies, knock-down tubular fixtures for wing and fuselage construction with heavy rigid fixtures. Old time aircraft men said design changes would obsolete these so fast that cost would not be reasonably amortized. Automen said planes could be built so fast cost would lose significance.

JIGS - FIXTURES

Typical of rigid Ford fixtures, this one has permanent locating points to assure interchangeability of parts.

Here, workmen are assembling bulkheads and spars for outer wing. Note top boom suspension for withdrawal of completed wing.

• Design and construction of major fixtures is a clue to Ford methods in mass-manufacturing the B-24. Rigidity and, in many cases, easy insertion and withdrawal of workpieces are innovations.

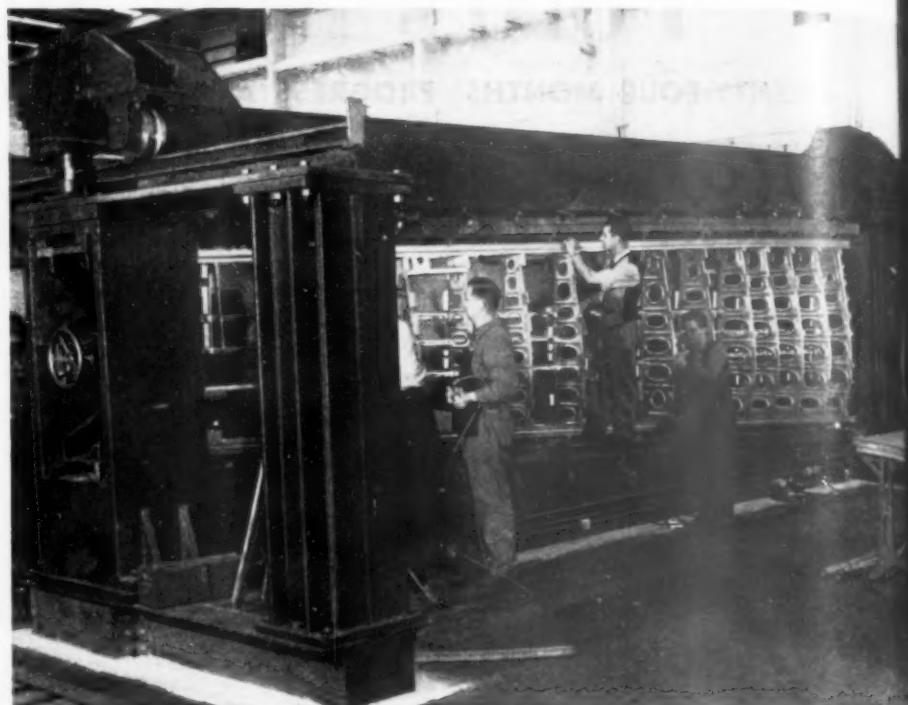
Perhaps the best example of Ford-type major fixtures is shown in the construction of the Center Wing. Wing structure demands a strong internal frame-work. Engines, fuselage and bomb cargo all hang from this combination of spars, bulkheads, stringers and skin. The 110 foot spread is divided into three sections: a center wing and two right and left assemblies known as Outer Wings.

Most complicated of these assemblies is the Center Wing, which extends through the fuselage as a unit. From it are suspended engines and landing gear. Self-sealing fuel cells and wells in which landing gear retract necessitate auxiliary construction to overcome stress on supporting members where continuous structure is interrupted.

A description of minor assemblies is important to appreciation of design and construction of the 60-foot major assembly fixture. By breaking this huge fifty-five foot section into minor assemblies more men work within less actual cycle time.

Until Ford began production, it had been thought by many aircraft construction engineers that stringers and big sheet aluminum skin panels could not be assembled separately from bulkheads and spars and still achieve interchangeability. Using rigid fixtures, Ford provided constantly accurate locating points.

Skin and stringer assembly is the first job in constructing outer and center wings. Previous to this, stringers are laid out on benches equipped with toggle



clamps and locating blocks. Brackets are riveted to them and forgings are riveted to the ends. The latter will eventually be used in bolting wing sections together. Meanwhile, they serve as important locating points.

Assemblies are separate for upper and lower skin. In vertical fixtures, stringers for the upper surface are laid horizontally across notched templates, contoured to wing surface. This assures accurate vertical location. Horizontal location and conformity to finished wing taper is made possible by bolting the forgings on the ends of the stringers to the ends of the fixture.

Four sheets of aluminum, sheared to extend from fore to aft spars, are strapped over the templates in which the stringers have been inserted. Skin is back-drilled through prepunched holes in the stringers which serve as drill guides.

Lower skin surfaces are built differently — because of a major assembly problem on the Outer Wing and a production design problem on the Center Wing, in vertical major assembly fixtures, upper skin surfaces are bolted by channel nuts and set screws to the bulkheads. Riveting to spars and intercoastals is done without difficulty because the rivet bucker can assist the riveter from the other side of the fixture. However, in bolting and riveting the lower skin to the structure, he is unable to work from the inside. Thus lower skin panels

For better understanding of the Willow Run plant layout and sequence of operation, explanation of the breakdown of the plane into sub-assemblies is necessary. In a meeting of engineering minds from Ford, Douglas and Consolidated, when the

government decided the B-24 should be built by all three concerns for assembly in new plants, it was decided to divide the ship into 70 items. Consolidated had broken the ship down into many small parts, but they were reaching final assembly in a less

complete form than the Ford system presupposed. Consequently, it had been built more as a contiguous unit, with interchangeability of parts exceedingly limited.

To ship parts to assembly plants Ford broke the ship along cleavage

consist of two long parallel members separated by several small sections in the center, permitting the buckers to reach inside the structure from the outside as each panel or section is fastened to the structure.

To compensate for the weakened structure and extra load stress around landing gear wells, lower skin surface is built up in laminations pyramided to five thicknesses.

All-Welded, the largest fixture is used to assemble the Center Wing section. Sixty feet long, 12 feet high, it weighs $27\frac{1}{2}$ tons. Forty such fixtures are grouped in batteries of five, each group having a common motive force for removal of the 10-ton boom which allows withdrawal of completed wings.

Previous assembly methods required tearing the fixture down partially for removal of a completed Center Wing. Because constant accurate location was not possible in this comparatively unrigid device, gages and surveying transits were needed to align the tubular members when the fixture was reset.

Location in this typical Ford fixture makes use of structural points. For example, the bearings for landing gear serve as location points. And the afore-mentioned forgings on the ends of the stringers serve again.

In this major assembly, the front spar is located along the base of the fixture, held in place by toggle clamps. The rear spar is similarly located beneath the top boom. Bulkheads are riveted between these members.

Skin and stringer assemblies are bolted to the bulkheads. Before riveting to the spar rails, skin is drilled on the fixture, hinged drill jigs at the base and top of the fixture being swung into position.

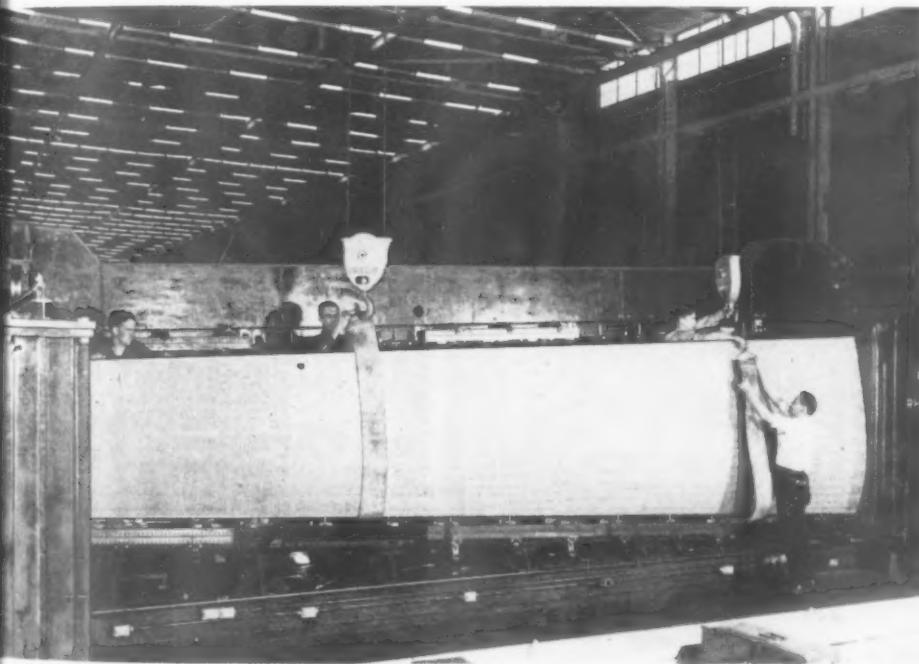
In addition to strengthening lower skin surface, around wheel wells, an auxiliary spar and bulk-head assembly is added to the structure. It is riveted into the Center Wing as an integral assembly. It is located by horizontal arms, pivoting from floor pedestals, that swing into the big vertical fixture. Adjustable plugs are seated into the five landing gear bearings, gaged to distance and angle.

Other major fixtures consist of both horizontal and vertical structures. Where feasible, trunnion fixtures are used to facilitate work from comfortable positions. On big fixtures, riveters and other workers are raised and lowered to working positions by elevators.

Perhaps the most dramatic fixture is the Ingersoll which performs eleven machining operations, to finish machine the wing for addition of accessories such as engine mounts, and landing gear. (*See photo on page 76*). Because of its weight a special concrete slab, 18-inches deep, and cast iron base, support the fixture. The wing is supported on a base, with accurate locating points. Toggle clamps swinging from turrets locate at the top. The wing is inserted vertically, leading spar first.

The fixture, after extensive research, was constructed at the Ford tool and die shop in the Rouge plant. The machine tools were built by the Ingersoll company.

Though use of rigid fixtures, assuring accurate location is no innovation in the automobile industry, handling assemblies as big as the center wing or fuselage section of the bomber were new experiences. Ford has not seen fit to attempt the introduction of moving assembly lines on these large parts, as he has done wherever possible in constructing automobiles.



Checking right hand outer wing fixture with a master dummy before placing it in production. Once checked, it can be used continuously without disassembling.

lines into major shipping items; such as the Forward Fuselage, After Fuselage, a 55-foot long Center Wing, Outer Wings and the Empennage consisting of Vertical and Horizontal Stabilizers, Rudders and Elevators.

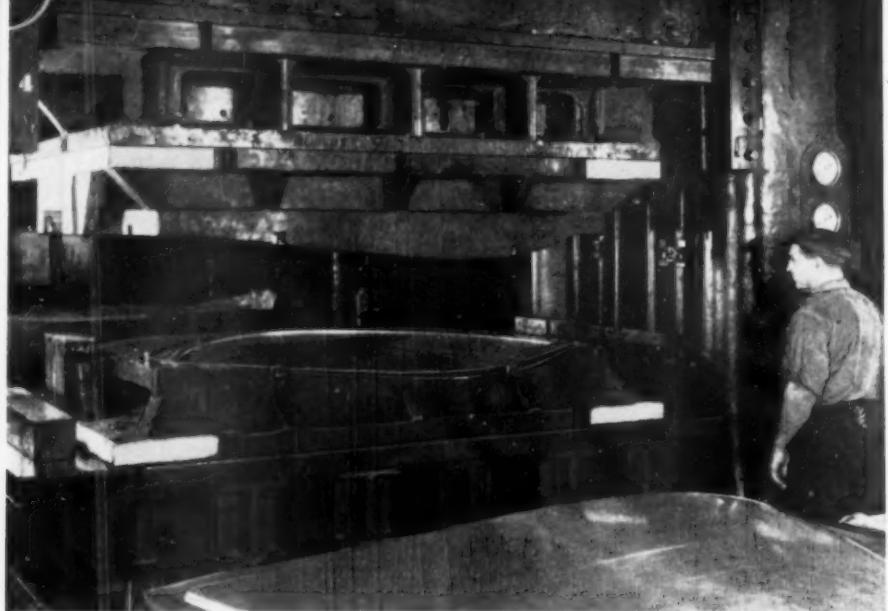
Whether for shipment or comple-

tion at Willow Run, the 70 items are fabricated into Major Subassemblies, to be mated on four Primary Assembly lines which converge into two Final Assembly lines.

Manufacturing and assembly operations occupy one enormous build-

ing. Plant layout provides for the continuous flow of work from one end to the other.

The short wing of the building, is devoted to parts fabrication and manufacturing. The long, vertical section is occupied largely by sub-



DEEP DRAWING AND STAMPING ALUMINUM

• Ford is deep-drawing aluminum with more than 13,000 hard dies. Double-action, hydraulic and mechanical presses, replace the slow, tedious drop hammer method which incorporates soft dies. Soft dies, though producing at a comparatively slow rate, can be altered quickly. Production is attained by utilizing several hammers.

Ford answers that his presses will make up for delay in alterations by the production rate. Differences in production time between hard and soft dies may be as great as between three minutes and several hours per part. Ford also points to the fact that soft die users must make changes on several dies, without beginning to equal production of one hard die.

Dies are built of plough steel for blanking and tool steel inserts for blanking and piercing are used for

Heat treat furnaces are conveyorized and designed for continuous operation. Parts are placed in baskets or racks suspended from rails which travel through the furnace. At right parts are entering furnace.

final assembly lines and plant booths. final assembly lines and paint booths.

All stock, parts and equipment are unloaded at one corner of the manufacturing section. Adjacent are material planning and shearing departments. Because aluminum and its

the most part. High-grade steel is used in draw dies.

Soft alloys are pre-drawn to within $\frac{1}{4}$ -inch of bottom. The unfinished part is then run through a degreaser and heat-treated to specified hardness. After quenching, aluminum maintains its soft state for varying periods of from 20 minutes to 96 hours, depending upon the alloy and thickness of the stocks. However, heat-treated and

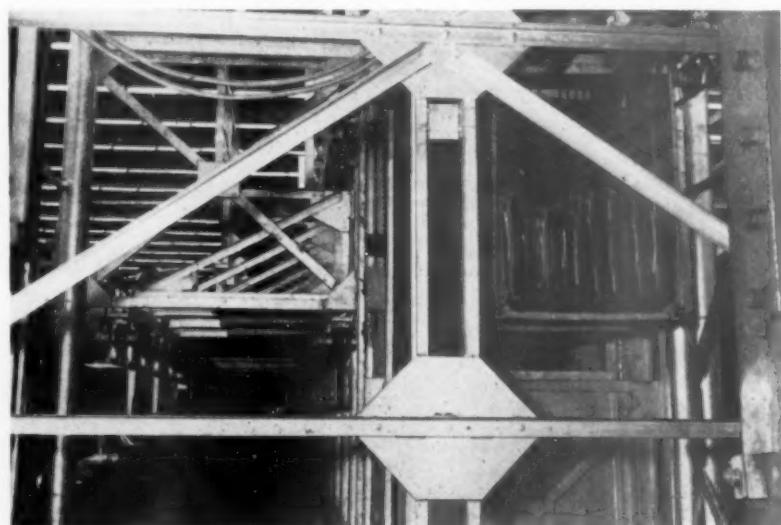
Use of mechanical dies is a distinctive Willow Run feature. Parts such as wing tip skin are made in one piece, rivet holes are pierced and the part is trimmed on another press.

quenched aluminum is generally warped, sometimes badly. The final draw straightens the warp.

If final draws cannot be made before the stock will normally harden after heat-treat, the soft state is maintained by storing semi-finished heat-treated parts at -20° F .

Ford is drawing parts previously built up from small stampings. The pilots' and bombardier's enclosure frames were produced from 27 parts. Ford produces them from five stampings.

Flat sheets are blanked to dimension. Holes for windows are partially blanked to relieve strains in the deep-draw, which are imposed because of the comparatively small radii in certain sections and because of the additional stress in drawing the channelling for frame strength. Following blanking, a first strike and re-strike draw the shape to a depth of 10 inches. Trim cleans out space for plastic panes and annealing relieves strains.



alloys are strictly rationed, emphasis is placed on layout of sheets for shearing into approximately 3,000 sizes demanded by parts manufacturing departments.

Near the shearing shop, another department slits coil stock up to 20

inches wide into narrow ribbons for conversion into rolled sections, such as stringers.

The press shop is adjacent to the shearing department so that a minimum of conveyor is necessary to move aluminum stock cut to shape directly

to the presses.

Because of the hundreds of shapes required, equipment in the press shop is considerable. Yet less stampings are produced at Willow Run than previously produced for this ship or any of comparable size as a result of the Ford development of deep drawing aluminum. Some individual parts are made in one stamping which, by other manufacturing methods require a dozen or more individual stampings.

PRESS EQUIPMENT

Most of the press equipment is mechanical, though a few units are hydraulic, ranging between 10 and 1,000 tons.

Heaviest of the mechanical presses are rated at 750 tons. Both types are double action. Four special design units are hydraulics, two stories high. Bases and hydraulic equipment are on a basement level. Two machines are Lake Eries; two built by Hydraulic Press Mfg. Co.

To replace the slow, tedious drop hammer method of shaping, they have evolved a method of deep drawing of aluminum which is performed in three major operations. Working on parts of SO stock with draws as deep as 10 inches and 12 inches, initial draws are made to within one-fourth inch of bottom. The shape is then removed from the press, run through a degreaser, heat treated and the final short draw restruck. If the process is interrupted, as when one press is in heavy production, refrigeration at -20° F. is utilized to maintain the SW condition until the final draw can be made.

Also near material receiving docks in the manufacturing section of the plant is the Cold Heading Department, where rivets are produced from wire stock. From this department most rivets are conveyed to degreasers, heat-treated and corrosion-proofing tanks.

TOOL AND DIE ROOM

One acre of floor space in the manufacturing section is devoted to a tool and die maintenance room. There, all dies, fixtures, templates and special tools used in manufacturing and assembly are repaired and new tools necessitated by almost daily part-design changes are finished.

Among the 150-odd machines in the department are a Keller Profiler, vertical Ingersoll and Cincinnati Hydrotels. Indicative of the modern plant facilities is the dust collection

RIVETING

• Portable pneumatic equipment, gang riveters, and automatic machines which pierce, feed and pein drive the 700,000 rivets required to construct the B-24. Portable guns are used largely on the upright wing and fuselage fixtures.

Twenty-foot spars are assembled with 2,500 rivets from spliced webbings, rails and L-section stiffeners. Pre-drilled and tacked together with skin fasteners, they are fed on roller conveyors through a line-up of several riveters. The line-up provides continuous peining of the varying sized rivets.

Eleven rivets may be driven in a triangular pattern by one anvil on a gang riveter. Hand riveters



After heat treat, rivets are stocked in refrigerators to maintain "soft" condition. Rivets will harden to specification shortly after removal from the refrigerator.

On some riveting operations, buckers must crawl through a wing structure to assist the riveter.

A few midgets are assisting in this work because of the ease with which they can squeeze into confined areas.

or smaller anvils, demand retracing steps in riveting a large pattern with the result that moving back and forth in one area tends to squeeze the neoprene between the metal sections. Frequently users of this method must redrill or pierce holes which have been filled by neoprene.

Ford is developing a double head riveter for use on wing spars. Anvils operate on each side of the spar as it is fed through a slot.

In the bomb door, 900 rivets are driven by an automatic single-head Enco punching and riveting machine.

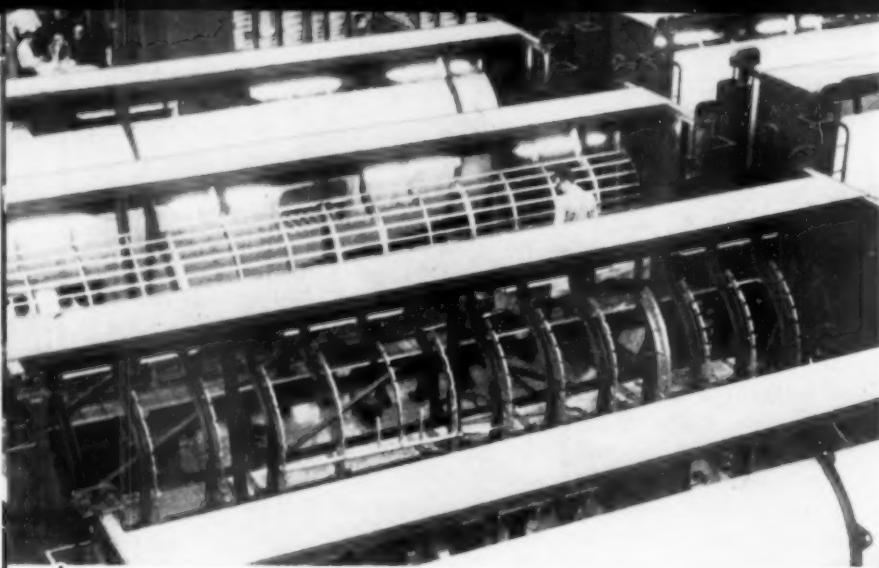
The single head pierces, feeds the rivet and peins — three operations at one station. The operator feeds the part by hand. A pedal activates the machine.

Rivets are manufactured in the cold-heading department.

The bulk of the rivets are corrosion-proofed by Alroking, using a time-controlled set-up, where conveyors automatically dip and rinse baskets filled with rivets. Degreasing and for a major share of rivets, heat treat, precedes Alroking.

Rivets are maintained in a "soft" (SW) state in large refrigerators. For immediate supply they are also held in small refrigerators adjacent to fixtures.





Constructing fuselage panel, notched templates conform to panel contours, assure vertical location of stringers. End forgings, later used in mating, bolt to fixture for horizontal location.

STRINGER MANUFACTURE

• Bomber skin panels consist of sheet aluminum alloy supported and held to contour by aluminum stringers, sometimes known as stiffeners. Length of these members ranges from a few inches to more than 20 feet. Varying strength and design requirements determine cross-section, though most stringers are formed to L, Z and U sections, with many variations.

Stringers are manufactured from sheet stock slit to specified widths and fed into Yoder forming machines. Eleven machines have been set-up, ranging from single stand (two spindle) to three, five, seven and 12 stand (or 24 spindle) rollers. Stands on multi-roller units, spaced approximately one-foot apart, progressively produce more complicated shapes. Dies with cutting edges conforming to stringer cross-

sections, automatically cut members to approximate lengths.

Spindle or roller set-ups can be changed to meet production requirements. Usual procedure is to manufacture sufficient stocks of each shape to supply sub-assembly before changing set-ups.

After forming, stringers are heat-treated in the department. The furnace accepts parts up to 31 feet in length. It provides an automatic cycle, so that passage from time-controlled heat to quenching chamber requires only four seconds, speed being necessary for proper heat treatment of aluminum.

Quenching has a pronounced warping effect on these long slim members, more so than on other parts. Following quenching, the warped stringer will remain in S W

condition for periods up to four hours. Taking advantage of this phenomenon, the part is clamped in a horizontal position between an anchor post and a hydraulic piston. The member may be stretched as much as 3½ percent. Stretching straightens the part, and work-hardening develops its hardness to specifications (S R R condition), accelerating the reaction from heat.

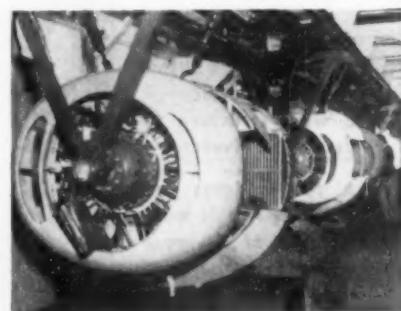
Stringers are usually pre-punched for riveting to skin. Gang punches pierce holes to 1/32-inch undersize. These holes serve as guides for drilling the skin in a sub-assembly fixture. Proper size drills also ream the punched hole and remove burrs from punching.

On Apex bending machines, known as "wipers," stringers are bent into arcs and angles around templates which conform to particular wing and fuselage contours. Where shapes are hard to hold, the strips are pulled around a form by hydraulic action, stretching the metal, causing it to set and return to correct shape — overcoming "springback." Though not a stringer, the rear gun turret track is formed from extruded aluminum alloy Buffalo rollers.

system for a long battery of grinders. Each unit is cleaned automatically by a vacuum system connected to overhead disposal pipes. The system is designed to remove steel dust from the grinding department and to protect the operators.

Because of the limited number of machining operations necessary in bomber production in relation of the size of the assembly job, the Machine Shop appears unusually small in the vast factory. Well equipped, however, it prepares small aluminum, magnesium and steel castings and forgings for heavier structural portions of the plant. A number of high production jobs are performed in turning out small parts from alumi-

num tube and bar stock. Most of the magnesium machining for bomber parts is performed in Rouge plant machine shops. No forging or casting



Dress-up where Pratt & Whitney engines are prepared for installation.

is done at Willow Run, all of these unfinished parts coming from other Ford plants and sub-contractors. The adaptability of women workers in aircraft manufacture is exemplified in the Willow Run machine shop by the fact that approximately 40% of the workers there are feminine.

The Tube Bending Department produces 3,000 to 4,000 feet of shapes for twelve different tube systems. These systems are comprised of some 1,200 pieces, for fuel, oil, oxygen, anti-icer and de-icer systems, heater and fire extinguisher hydraulic and vacuum systems.

Ninety percent of the metal tubing is aluminum alloy. The remainder is stainless steel and copper. Aluminum

alloys used are SO 52 and ST 17 and 14. On six pieces of stainless steel tubing are used on heater tubes, while about 50-feet of copper tubing is needed on the oil system.

Tubes range in diameter from one-fourth inch to 2 inches, and in wall thickness from .022 to .049. Work performed in the department includes the bending of metal tubes, flaring or beading the ends, adding fittings needed to couple sections together, and marking the tubes with part number and tube system color code. Hydraulic tests are performed before assembly.

Tubing systems are handled as subassembly units. Most of the tubing systems throughout the plane are strung close enough together to permit pre-assembly on brackets which can be installed on each major sub-assembly of the ship (item) and connected on the fuselage mating bucks and primary assembly lines.

Fuselage and wing surface skin, bulkheads, stringers and other shapes cut to size and stamped to correct shapes are brought by conveyors from the manufacturing section to the assembly fixtures in the base of the two main assembly bays.

WING ASSEMBLY

In the left hand bay, 25 foot-long Outer Wings are assembled in two parallel batteries of permanent fixtures. In the same bay, nose or fore fuselage sections and after fuselage sections are fabricated in parallel rows between the last Outer Wing fixtures and the commencement of two primary final assembly lines.

Several five ton cranes overhead carry these completed assemblies forward to the final assembly lines, or to a transverse overhead bridge that crosses the assembly bays and carries shipping items to railroad and truck sidings for shipment to new southern assembly plants.

Empennage sections are assembled in a sub-assembly bay. Upper and lower skin and stringer assemblies are built on fixtures in the lower end of the right hand assembly bay. Farther on in this area, immediately below the two secondary final assembly lines, are the 60 foot-long fixtures in which the huge Center Wings are fabricated.

CENTER WING

This bay is likewise serviced by five-ton overhead monorail cranes. When assembly of the 55 foot-long

Center Wings has been completed, the booms of the fixtures are rolled back, the assemblies are lifted out and moved to a special-purpose Ingersoll machine in the area where all machining of the wing is performed. Subassemblies are painted in spray booths in these bays. When moved forward by monorail and conveyor to the transverse shipping bridge or four secondary final assembly lines, major parts are ready for final assembly into completed bombers.

Thus, from the lower end of the two assembly bays to the beginning of the final assembly lines just beyond the transverse shipping bridge cutting across the middle of this wing of the plant, major assemblies are completed and readied for final assembly on four primary or Mating Final Assembly Lines.

These major assemblies include such important component parts as the Center Wing, Outer Wings, Forward and Aft Fuselage. These were assembled in jigs and fixtures from Minor Assemblies such as fuselage panels, and pilots and radio operator's floors which are built on still smaller fixtures from Sub-Assemblies. The latter are comprised of hundreds of

MACHINE SHOP

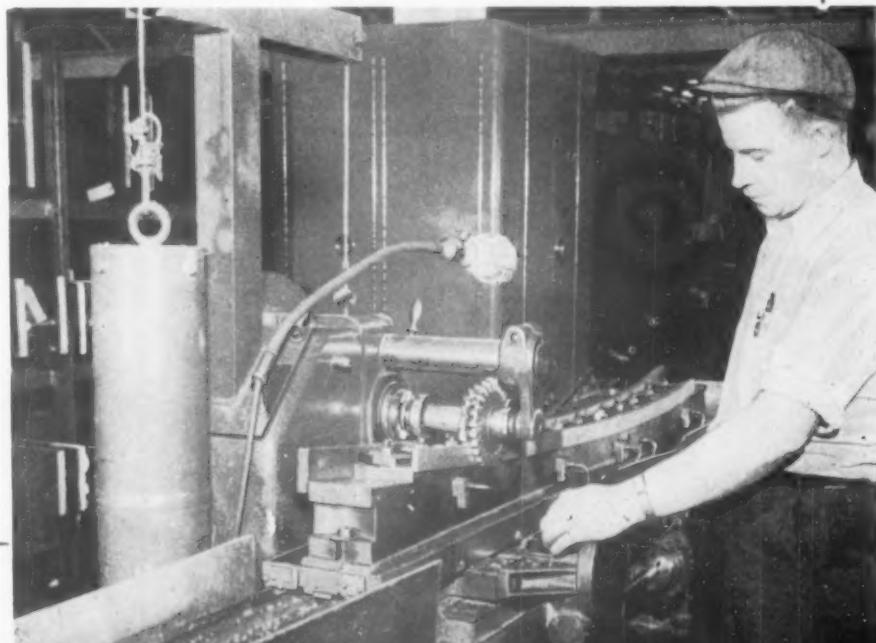
The machine shop in the manufacturing department at Willow Run, contains little that could be called unconventional. Standard milling machines, planers, screw machines, turret lathes, shapers and drill jigs are used.

One addition to a horizontal milling machine indicates the extent of expediency required to adapt standard equipment to production needs. Both faces of one angle of an L-section splice plate, used to join center and outer wings together, are milled. Conforming to the wing surface section contour, the plate is curved in one plane, but the faces which are milled lie in

a plane perpendicular to the curved member and parallel to the chord of the arc.

A holding fixture which is mounted on the bed of the machine has a curved surface conforming to the curve of the splice plate. A roller on the arbor of the mill and adjacent to the side-milling cutter

straddling the work, bears on this surface and guides the cutting head which moves freely on a vertical slide. Weight of the head holds the roller firmly against the guide. Gravity carries the roller down the curve and table feed acts to run it up the other side, raising the head to maintain depth of cut.



Milling of wing splice plate is simplified by use of holding fixture and specially mounted cutting head. Cutting head is counterbalanced by weight and rides on guide rail in conformity with contour of plate.

dissimilar small shapes, such as bulkheads, stringers, spars and skin which are cut and shaped in the manufacturing section of the plant.

First Major Assembly on the final lines is the big Center Wing, which is suspended by trolley plates on monorails running 55-feet apart. Each of these four Primary Lines is composed of 12 stations where eight hours theoretically are consumed in adding parts to the plane. Sliding electrical contacts and compressed air outlets at each station afford power for the tools.

At the first station, a canopy is installed over the top of the Center Wing. The first Mating Buck is located at the second station. Here bomb racks are installed, the catwalk between the forward and aft fuselage sections is added.

At the fourth station, the Forward Fuselage is lowered from the mezzanine and mated to the Center Wing, still suspended by monorail. Following the addition of more parts and inspection of assembly work, the Aft section of the fuselage is lowered from the mezzanine and mated to the Forward Fuselage at the eighth station. Before leaving this station, landing gear is lowered and the ship moves on its own wheels.

MATING BUCKS

In joining fuselage sections on the final line, cast steel mating straps encircling the sections adjacent to the splicing surfaces are important factors in maintaining structural alignment in the assemblies. They also

PILOT'S FLOOR SUB-ASSEMBLY

• Perhaps the most complicated sub-assembly job performed at Willow Run consists of mounting plane control equipment on the pilot's floor. Entire flying control and performance is activated and checked by the levers, switches, gears, valves, meters and connecting tubing, wires, rods and cables assembled on floor structure of the pilots' compartment. Assembly is simplified as much as possible by pre-assemblies of equipment, including wiring and tubing, on supporting frames, posts and brackets.

The floor itself is constructed of skin, stringers, bulkheads and beams. Seven stationary fixtures are used to complete the floor and mount the flying control pedestal. Parts manufactured to size, are drilled, fastened with Cleco snaps and riveted. Mating is done in a trunnion fixture.

The floor sub-assemblies are clamped in one of 30 trunnion fixtures, mounted on trucks which travel slowly but continuously

around an oval track. Approximately six men work at each station, and though each man must finish his assignment at a given station, his work may but partially complete a job which others will complete in three or four stations beyond.

Parts and tool cribs are located at each station a few feet inside the perimeter of the rails.

Example of an operation which requires passing through four stations for completion is determining plumb for the wheel shaft. Pin in hole locations on the trunnion fixture assure the horizontal level of the floor structure while the plumb of the shaft is determined.

The work is maintained in the fixture at an angle of 90 degrees to the horizontal while passing through most stations. In this position it is possible for men to work on both top and bottom sides from the floor of the truck. When half the assembly is completed — all one portion of the pilots' floor below the axis of the fixture — the

facilitate locating fuselage units on mating cars. The straps are an integral part of each fuselage sub-assembly, and remain with the units until

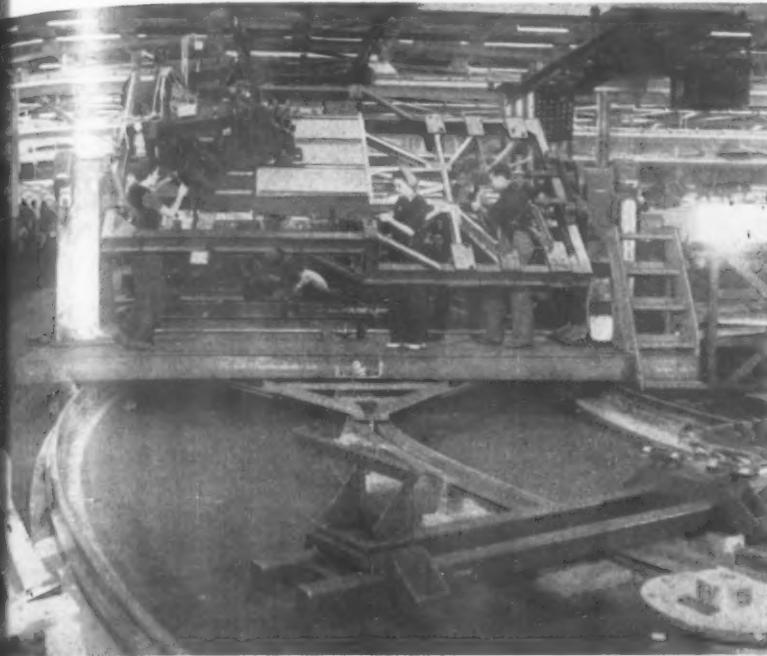
they are joined. Straps are bolted through skin and bulkheads and are not discarded until they have served to furnish cranes a hold in lifting the section from the mating bucks in fuselage assembly.

The four engines are lowered and mated to the Center Wing at the ninth station. The empennage, consisting of the vertical and horizontal stabilizers and tail controls, is added at the tenth station. When the ship leaves the twelfth station, assembly has reached the point where gunners' turrets have been installed.

At this point, the two assembly lines in each bay converge into one Primary Final Assembly line. Now,



Finish machining on 55-foot long center wing is done in this fixture. Eleven machining operations are performed simultaneously, including four milling, spot-facing and drilling jobs on engine mount castings and four boring operations on landing gear bearings.



Pilot's floor assembly is performed on trunnion fixture—one of 30 identical fixtures which travel continuously on oval track from station to station.

fixture is turned 180 degrees to permit work on the uncompleted half.

For the few stations through which the floor is maintained at horizontal position, safety rails are

installed around the fixture to prevent workers from falling off.

Complete cycle of a fixture comprises 30 stations, including loading and unloading.

the entire width of each bay is occupied by a single ship, resting on its landing gear and following others in parallel lines through four hour stations to the end of the plant.

With four lines converging into two, commencing at the thirteenth station, space is available in each bay to permit the addition of the 25-foot long Outer Wings and two and one-half foot long Wing Tips. At the 12th station, where the Outer Wings are added and the nose assembly is installed, the wings occupy 110 feet of the 150-foot wide bays.

READY TO FLY

At remaining stations, smaller installations are made—such as flaps and ailerons. In enormous paint booths closed off from the rest of the assembly lines by overhead doors 36 feet high, the ships receive an overall exterior paint and camouflage job. At succeeding stations, final installations are made, the planes are weighed, fueled, and roll out of the end of the

factory under their own power.

Because of the added distance at a right-angle turn near the end of the final assembly bays, four more planes are accommodated in one final line than in the other. Consequently, there are 16 stations in the inner line and 20 in the outer line.

The value of ample light in bettering output and achieving closer tolerances in production has been utilized to the fullest extent at Willow Run. Completely illuminated by fluorescent, more than 70,000 fixtures blanket the ceilings of the building.

Described as an innovation in aircraft plant lighting is the use of individual portable fluorescent units among the fixtures. These small units, which are equipped with stands and clamps, are moved readily into the heart of the biggest fixtures. A crew of about a dozen men spend 10 hours daily replacing and adjusting the fluorescent units in the shop.

Skepticism about the feasibility of adapting mass-production automo-

bile methods of manufacture to bombers was based not alone on the multiplicity of exceedingly complicated forms and structures in a big plane, but on the complicating problems presented by continual changes in design.

Engineers at Willow Run admit that these changes, present a problem that is taxing the imagination of their best tool designers. These changes, which are determined by the Army and aircraft builders, are listed in four general classifications: 1. Safety; 2. Military necessity; 3. Production improvement; 4. Miscellaneous corrections.

Well aware that these changes have at times radically affected the basic design of major portions of the ship, Ford engineers staked their reputations on licked the problem of tooling on a mass production basis. Difference of opinion on the approach to the problem of speeding big plane production largely centered around this point. Would the continual change in design obsolete tools before they paid off in high production.

AUTO METHODS PRODUCE PARTS

The automobile method of tooling is delivering high parts production, halving and quartering production time on individual items, and by tool design that is flexible enough to permit considerable change in the shape of the finished product without scrapping an entire tooling set-up for a change in design.

MATERIALS USED IN THE FORD BUILT CONSOLIDATED B-24

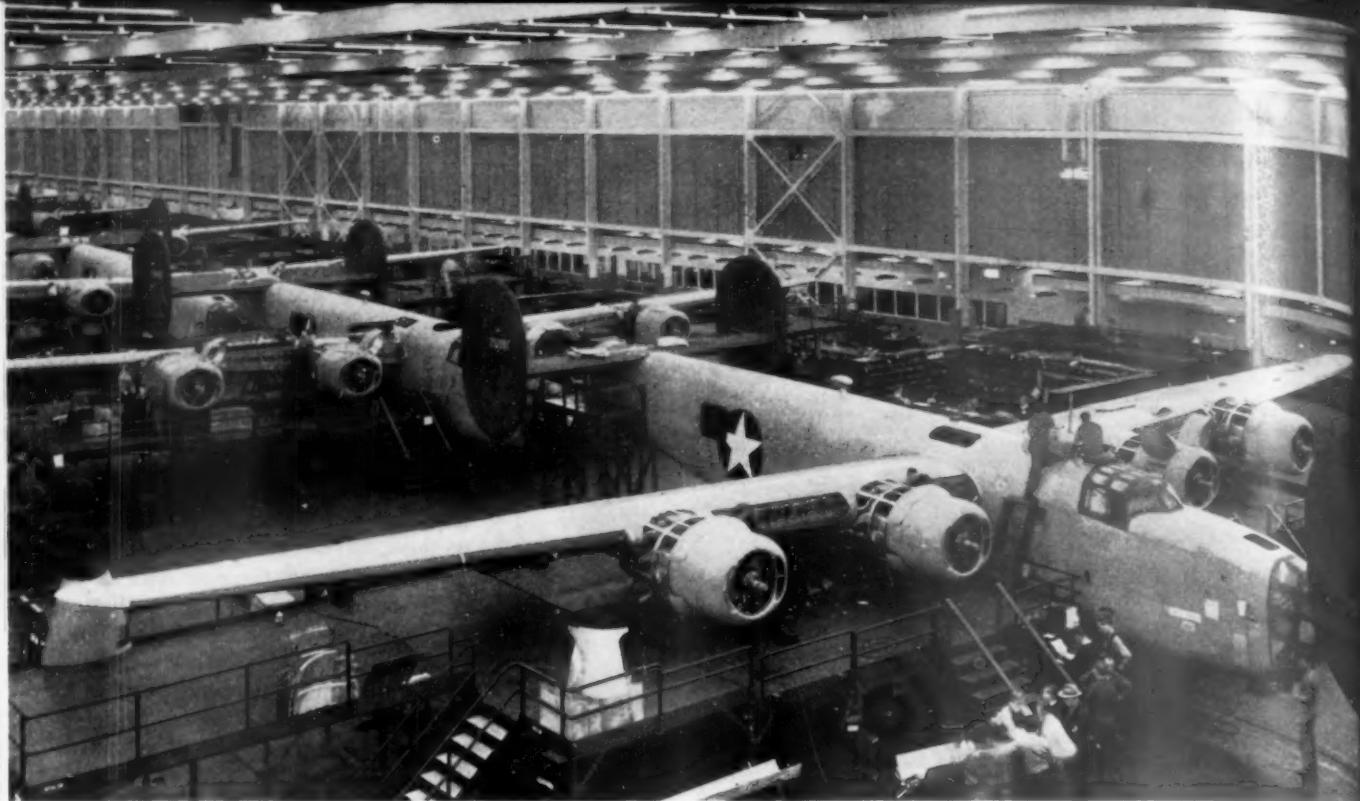
Aluminum alloys	85.00%
Steel	13.00
Magnesium	00.33
Brass, Copper & Bronze	00.66
Rubber, Glass, Plastics	01.01

100.00%

To undertake mass production of this ship, with the interchangeability of parts common to the automobile industry, Ford was forced to introduce methods foreign to those standard in aircraft manufacture, and then build a plant large enough to house the tools and machinery necessary for such a system.

Big-bellied ships are moving off final assembly lines today.

Cost is significant in the story of



B-24's near the end of the assembly line at Ford's Willow Run. About 300,000 parts and 700,000 rivets have been assembled to produce this giant fighting machine.

Willow Run, for its achievement could never have been fulfilled had plans been made on a compromise-with-cost basis. Since the day a small group of Ford engineers huddled in a San Diego room two years ago and decided they could build this big ship on production basis, it has been an inviolable rule that every machine, fixture or tool that could be designed to handle a specific operation better or faster should be utilized. . .

"What if we do spend \$40,000,000 on dies," Ford's Charles Sorensen has been quoted. "What would such an investment amount to when spread over 4,000 bombers costing \$250,000 each, for example. Why, we could write off the whole die cost on this output alone." The Ford production chief emphasized at the time that the figures he used were hypothetical, merely illustrated a viewpoint, and could not be construed as actual cost or production figures.

"It is our understanding that the country wants planes; wants a lot of them and wants them fast. That's why we have set up this plant this way," he added.

THE END.

TUBING ASSEMBLY

● Preparation and assembly of tubing for the bomber well illustrates the Ford system of mass-production. It illustrates in particular the way in which they have tackled the job of building the B-24.

Of the seventy sections of sub-assemblies which comprise the ship, a major share of them contain portions of the tubing comprising the 12 systems upon which plane operation is dependent. Contours of wing and fuselage, as well as the hundreds of accessories and instruments stationed throughout the ship, prevent any approximation of a straight route for tubing to follow in many instances. However, despite the circuitous layout, it follows the same paths on every plane.

In the plane, there are more than 3,200 feet of tubing. From stock, it is cut to length, bent, flared or beaded, fitted, identified for a section of the plane, and sent to Tubing Assembly.

Ford production methods consider assemblies, and sub-assemblies as integral units in design but isolated in manufacture.

Thus, every one of the 70 assembly sections is built as completely as possible. This means that any given piece of tubing is manufactured for a particular section of the ship — though it may be a connecting line between wings and pilot controls. It is cut to a pre-determined length, curved to specifications and assembled in a bracket with other tubing to complete a tubing assembly for that section of the plane.

Thus tubing is made up in assemblies, generally including the holding brackets that will be bolted to the sides of the fuselage or wing section for which it has been sub-assembled. Around the engines, where tubing passes through stainless steel fire walls, the vertical wall becomes part of the tubing assembly, and is thus installed with it in the wings.

When a section of the plane is brought to the final line, it is complete with tubing which was a sub-assembly to that section. When one section of the plane is mated with another, tube connections are made simply and quickly.

Extracting Broken Tools

To reduce scrap in aircraft engine production, considerable effort has been made to cope with tool breakage in machined parts. Burning and welding are methods used by a leading builder.

IN MOST CASES, broken threaded tools and unthreaded tools in machined parts are removed by different methods. However, there are instances when a combination of methods must be employed to remove either type. Use of the methods to be described presumes that broken tools are too hard to be drilled or bored out by ordinary means. Also, the tools may be lodged in aluminum, magnesium or steel parts.

As the necessity of salvaging machined parts is as old as manufacturing itself, many methods for removing broken tools have been devised. However, two applications are credited with a major share of savings.

THE BURNING METHOD

THE BURNING METHOD is used to remove broken threaded tools such as taps, thread gages and set screws, which cannot be removed by easy-outs or other simple means.

This job can be done with a pedestal type fixture having universal characteristics whereby the part containing the broken tool can be held in any position necessary to align the center line of the broken tool with the center line of the copper tube of the automatic vibrator burning mechanism. One arrangement is shown in Figure 1. If a more simple set-up is desired the machined part can be held in a bench vise and the burning mechanism can be clamped to the bench. In any case, the machine part must be firmly "grounded" to one side of the electrical burning circuit, and the center-line of the broken tool must be aligned with the center-line of the copper tube extending from the burning mechanism.

To start the burning action, the compressed air and electricity are turned on, the vibrator is started and the end of the copper tube is brought into contact with the center of the broken tool. After the initial flash of sparks, alignment of the copper tube and broken tool should be checked. Then the clock spring in the sliding base can be engaged, making the feed automatic.

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PRODUCTION ENGINEERING DEPARTMENT
PRATT & WHITNEY AIRCRAFT

Diameter of the copper tube is determined by the size of the hole desired. For best tap removal, a tube diameter a few thousandths smaller than root diameter of the tap is used. This leaves undamaged threads already cut in the drilled hole. The remaining tap material, still brittle, can be picked out with a prod and the hole cleared by compressed air.

By using a square or triangular cross-section copper tube, a correspondingly shaped hole can be cut in hardened material. This permits the use of Allen head set screw wrenches to remove broken thread gages and set screws.

Partly because of the refrigerating action of compressed air passing from high to low pressure through an orifice, metal surrounding the burned hole remains surprisingly hard — usually advantageous when square or Allen head wrenches are to be inserted.

For rapid burning, and to make a

precision hole, the automatic vibrator burner mechanism (Figure 1) was developed. Figure 2 shows details of the vibrating mechanism. The vibrating member, being fairly heavy, delivers a series of mechanical impacts through the "kick-back" screw to the disc on the copper tube assembly. This creates the oscillating contact action between the end of the copper tube and the part being burned. Compressed air, passing directly through the copper tube assembly, helps hold it in a forward position. A clock spring in the base, operating on the Hand Starting Position Adjustment shaft, tends to move the entire mechanism ahead as burning occurs.

Speed of burning depends upon the capacity of the transformer and electrical circuit back of the burning mechanism, the amount of compressed air, the type of material being burned, and the vibration frequency. An electrical circuit capable of supplying 275 amperes at five to six volts A. C. is satisfactory, and a vibration frequency of about 400 per minute works well.

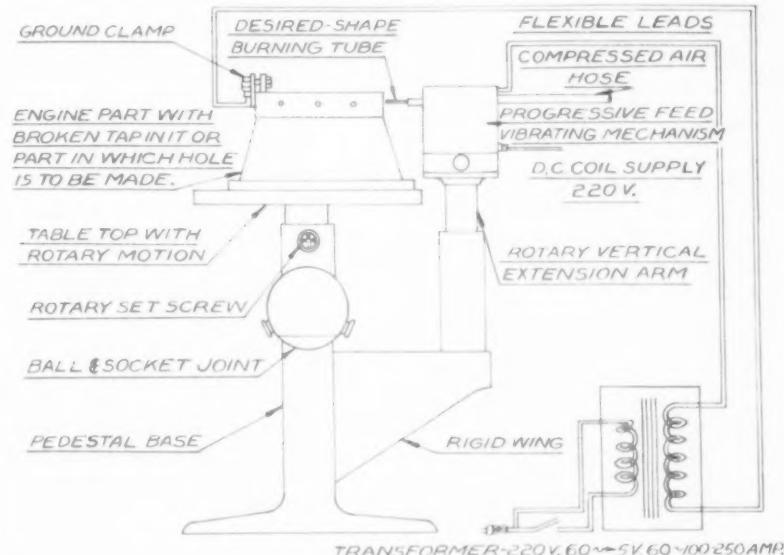


Figure 1, universal burning fixture for making hole of any cross-section shape in hardened material and burning out broken tools. Used on threaded tools.

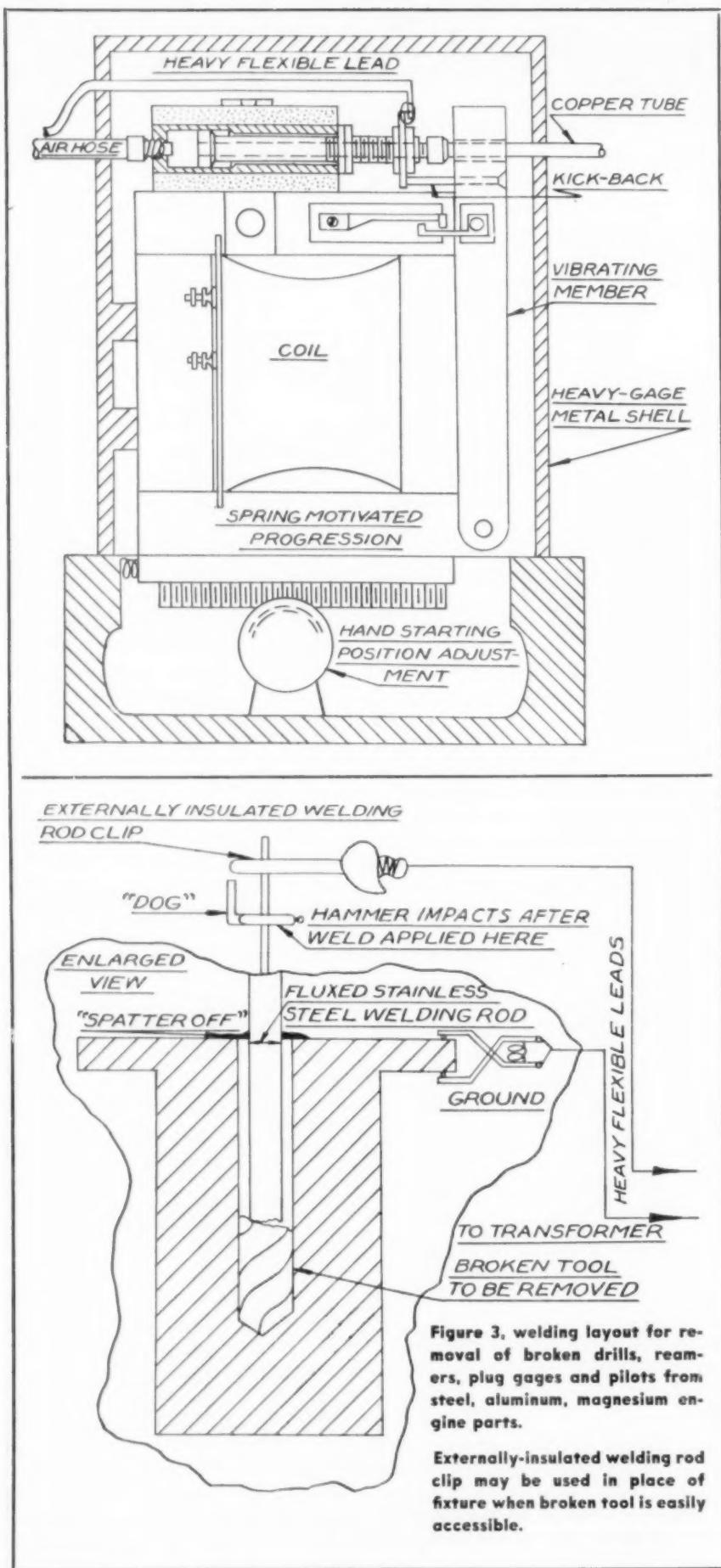


Figure 2. the vibrating mechanism used with tap burning equipment permits automatic burning and eliminates human element.

To remove a thread gage or set screw, a square hole may be burned in and a square-stock wrench inserted. To preserve the quality of threads in the machined part, too much strain on the wrench must be avoided. In aluminum or magnesium parts, undue strain may cause the threads in the hole to "pick-up."

If the gage or screw is too tightly bound in the hole to respond to normal pressure on the wrench, a small amount of heat applied around the hole may expand it sufficiently to permit releasing the gage under normal pressure. Up to about one-half-inch diameter, a thread gage can be removed by automatic burning, using a copper tube with a diameter slightly less than the root diameter of the broken tool.

When larger thread gages are lodged in steel parts, a combination of methods is used. If the hole containing the gage passes through the machined part so that the gage is accessible from the rear, wet asbestos powder should be packed tightly behind it. Otherwise, the automatic burner should be used to cut a hole through the gage so that wet asbestos powder can be pushed through it to fill the cavity back of the gage. A protective compound (described later) should be carefully spread over the external surface of the machined part. This procedure prevents flying molten metal from damaging finished surfaces both behind the gage and on the outside of the machined part.

After proper protection, a welding unit is used with a carbon rod to burn away the gage until only a ring of metal is left in the threaded hole. Wet asbestos and a protective compound having considerable fluid content serve to preserve the heat treat of the machined part. Fresh protective material is added as the heat of the arc vaporizes the fluid.

After this process, the remainder of the thread gage is broken out and the original bright quality of finish is restored by proper cleaning. Variations of this method are used to suit particular circumstances.

THE WELDING METHOD

PRIMARILY, WELDING is used to remove unthreaded tools — broken drills, washers, plug gages, Allen head wrenches and prick punch points. The process consists of making an electric arc butt-weld between a stainless steel welding rod and the broken part, and then extracting the broken part by tensile impacts to the welding rod.

The welding transformer found satisfactory for this method has a variable current rating up to 250 amperes. Figure 3 shows the circuit for this setup. Stainless steel welding rods, varying in size from 1/16-inch to 3/16-inch diameter, and having an external coating of hard dry flux for insulation are used to make the butt-welds between the rod and the broken tools to be removed.

To protect the surfaces of the machined part a protective compound* having the consistency of medium lubricating grease, is spread over the surfaces when there is danger of damage from the arc-flash. The heat of the arc-flash immediately hardens the compound into a non-combustible, protective crust.

After welding and tool extraction, this coating can be quickly removed, and washing restores the surface finish. In specific cases, other forms of protection are used — wet asbestos powder, fibre washers or bushings and 1/4-inch brass plate drilled to fit over the opening of the drilled holes (especially when the broken drill is at the surface of the hole).

Figure 4 shows an operator preparing an engine part for the extraction of a broken drill. Using a high pressure air hose, the hole containing the broken drill is cleared of all extraneous matter. A small prod carefully used often helps in removing chips jammed between the cutting edges of the broken drill where the butt-weld is to be made. If the chips are aluminum or magnesium, it is always good practice to minimize the possibility of blowback and unnecessary oxides in the vicinity of the welding surface because of ignition of the chips when the arc contact is made.

Since proper cleaning prior to welding usually saves labor, carbon tetrachloride should be used to wash out cutting oil or coolant films. After cleaning, the protective coating may be applied to the finished surfaces of the part.

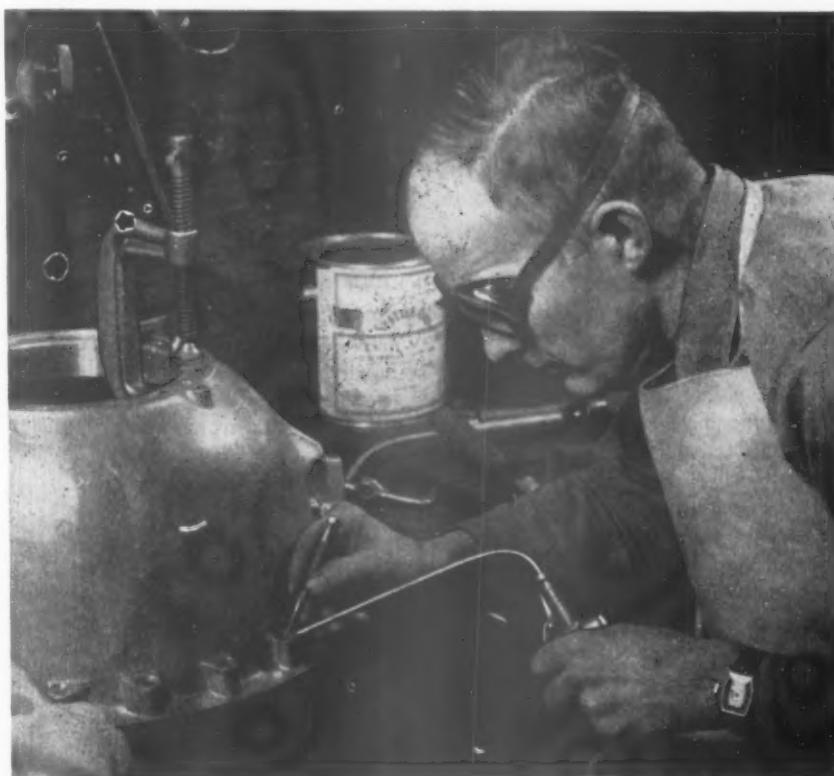
*Spatter-Off, a product of the Presto Battery Service, Hartford, Conn.

In preparing the coated welding rod, it is good practice to round off the end on a grinding wheel to insure a good welding contact. Also, a "dog" should be tightened on to the rod near the end which is to be inserted into the welding fixture. The "dog" provides a place to apply impact with a hammer after the weld is made.

The welding fixture serves a dual purpose. First, it aligns the welding rod with the center-line of the broken drill. Secondly, after welding, it steadies the rod when applying hammer blows. It is particularly useful

at this time. Sometimes crystallization occurs in the weld or blow holes form because of the presence of cutting oil and various oxides, causing the weld to break. In such cases it is usually necessary to reinspect the point of contact of the stainless steel welding rod, clean the chip oxides from the drilled hole, or readjust the ampere rating of the power supplied to the weld to better suit the size and material of the broken drill.

Frequently, however, it is discovered that the broken drill was shattered when it broke. Occasionally as



Pratt & Whitney Photo

Figure 4, preparing an engine part for extraction of a broken drill. High pressure air hose is used to clear the hole of extraneous matter. Carefully handled prod helps remove chips near the welding area.

when extracting small broken parts where the diameter of the drilled hole is in the vicinity of .040-inch to .125-inch. The welding fixture is supported by a modified heavy duty lighting fixture, having its tubing replaced by solid shafting for greater rigidity. This inexpensive arrangement is satisfactory when properly anchored.

In Figure 5, the weld has been made and the operator is applying the extracting impacts. Broken drills, jammed tightly with chips, respond to impacts better than to steady pulling as with a tensile machine.

Quality of the butt-weld is tested

many as five to ten tries have to be made before a solid part of a drill can be removed. Also this is frequently the result of attempts to remove the drill by pounding the part or with a prick punch.

If operators and set-up men will set aside the part containing the broken tool, without any tampering, there will be a greater chance of salvaging the part and a real saving of time.

The photograph accompanying Figure 5 shows the 11/32-inch drill extracted from the hole in the bolting flange of the engine part. The part was cleaned and immediately return-

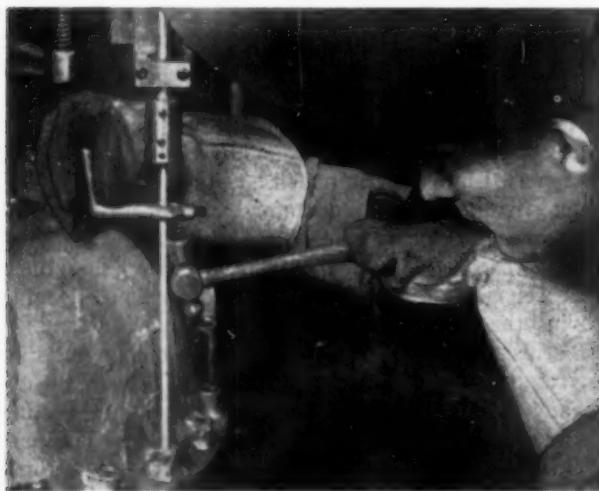
ed through the usual channels to production. Under the older method of burning with electricity and compressed air, complete removal of this broken drill would have required several hours plus repair of hole after removal. By welding, removal time was only a few minutes and the drilled hole was unimpaired.

Welding apparatus includes an arc welder with plug-in positions to make available ampere ratings from 20 to 250 amperes to suit the requirements of any job using welding rod from one sixteenth- to quarter-inch diameter. So far, 3/16-inch diameter stainless steel welding rod has been sufficient in tensile strength to do the toughest job — extraction of a four-inch long 7/8-inch reamer having eight flutes.

The smallest drill removed by this method was a .040-inch tool three inches deep in a 5/16-inch hole in an engine crankcase section. A previous method of removal would have been to trepan around the broken drill and insert a plug of the same material. This would have necessitated reoperation of the .040-inch oil hole in production. Time required for trepanning, plugging, relocating in the fixture and reoperating would have required several hours.

The new welding method used a 3/32-inch welding rod, ground to a sharp point at the contact end and covered with an insulating coat in the ground-down area. Current rating of the flex arc was reduced to 30 amperes, the welding rod was inserted in the three-inch deep hole, and centered on the .040-inch drill. Contact was made with the broken drill and the power

Figure 5, below, the weld has been made and the operator is applying extracting impacts with hammer.



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- The "know-how" of broken tool removal may always be necessary. However, more tools break than need be the case. Frequently, the job is at fault. In deep-drilling, chips may clog the flutes, causing the tool to bind and break. Step-drilling is the solution. And drill breakage, if not caused by "run-out," may induce it in time.

turned on. The butt-weld was sufficiently strong to permit extraction of the broken drill. As no damage was done to the .040-inch oil hole, the crankcase section immediately went back into production.

Unfortunately, a table of ampere settings on the arc-welding transformer for removing the various sizes of broken tools cannot be made which would be reliable in all cases. Because welding involves problems of electrical conduction, too many unknown conditions determine how much current will actually flow between the rod and the broken tool.

Such unknowns are:

1. How much broken tool is lodged in the hole?
2. How much coolant oil mixture is present to insulate the tool from the metal surrounding it?
3. How tightly is the tool lodged?
4. What is the metallic composition of the tool?
5. How badly is the tool shattered?

If these questions could be correctly answered, a reliable table of ampere settings could be made. Otherwise the operator must learn by "cut and try." A table may be made, how-



Above is shown the broken drill after removal. The undamaged engine part was returned to production.

Pratt & Whitney
Photos

ever, to indicate a starting point for beginners, but the five previous "unknowns" should influence the judgment. A good principle to follow is one in which a low value of current is selected for the first welding attempt, and then, if unsuccessful, the next higher current setting is selected until a good bond is obtained between rod and broken tool.

Tool Diameter	Westinghouse Flex Arc welding transformer ampere setting
.025" — .050"	20 — 23
.051" — .062"	20 — 30
.063" — .125"	30 — 56
.126" — .250"	56 — 110
.251" — .312"	110 — 200
Larger	110 — 250

There are two methods of making a butt weld: (1) by pressure; (2) by contact.

To make a *pressure weld*, the end of the welding rod is pressed against the broken tool and the power turned on for a fraction of a second. Contact resistance creates welding heat. Advantage of the pressure weld is the absence of a burning arc, minimizing excessive heat and the splashing of molten metal. The ampere setting on the welding transformer should be higher than that for the contact weld.

To make a *contact weld*, the end of the welding rod is held about 1/4-inch above the broken tool. The power from the A. C. welder is turned on by the remote control foot switch. The end of the welding rod is then brought into contact with the broken tool. The resulting arc flash causes molten metal to flow. The power should not be on but an instant as the welding rod will be burned away and the hole containing the broken tool will be filled with foreign material.

The skill of the operator determines the success or failure of the attempt. In every case he should give thought to the protection of the machined part from the heat of the arc.

Sometimes drills are lodged so tightly that the tensile strength of the drill is insufficient to withstand the impacts delivered to the "dog" on the welding rod. If a substantial amount of the drill remains in the hole, it is advisable to turn temporarily to the burning method, burning the drill away until the "back drag" of chips does not exceed the tensile strength of the drill. Then welding can be used.

THE END.

THE TOOL ENGINEER

Aircraft Bearing Checking Equipment

Production gaging split-line height and taper on half bearings is done by pressing work into lapped steel nests. Development of the successful method meant licking a problem in variables.

H. D. HIATT

SUPERINTENDENT, GAGE DEPARTMENT
ALLISON DIVISION
GENERAL MOTORS CORPORATION

THE PHASE of inspection of split bearings for aircraft engines which seems to arouse most controversy between manufacturer and customer concerns the split line height and parallelism of the joint faces. These dimensions in relation to the back or outside diameter of bearings are usually held to a total tolerance of .0003 to .0005, depending upon size and application.

Many different methods have been devised for measuring split line height and taper on joint faces, all of which exert pressure on the joint faces. Conventional equipment consists of a hardened, ground, and lapped steel nest with a half bore held closely to a definite size. The half bearing is

forced into this nest under pressure sufficient to guarantee a full or acceptable percentage of bearing over the entire outside area. Required pressure naturally depends upon size, material, and wall thickness of the bearing. One prominent bearing manufacturer has determined by trial with dead weight pressures that steel bearings require a load of 13,500 pounds per square inch of split face area to assure proper nesting without crush-

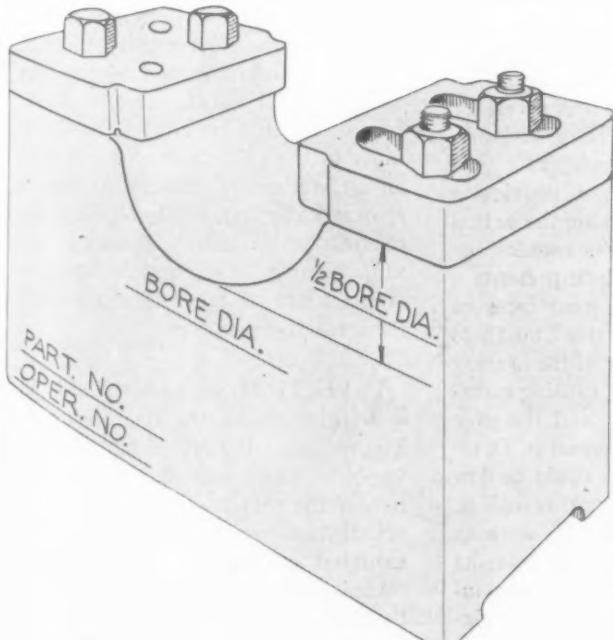
ing the material. Bronze areas require only half this load.

Gage designers have greatly varied the manner in which pressure is applied and the means for gaging height and taper. In fact, an evolutionary development of this phase has taken place in the Allison Plant, as will be shown by the illustrations.

Figure 1 shows the earliest method employed at Allison. The equipment consists of a nest with a solid stop on one side and a heel clamp on the other. The bearing is clamped into the nest using a torque wrench to insure uniform and predetermined pressure. The bottom of the nest block is lapped parallel with the bore and joint face so that it can be placed on a surface plate and the four corners of the bearing measured for their relative heights by means of a surface gage that is set from the top of the nest. This device permits an accurate check, but is a slow method, and therefore impractical for high production.

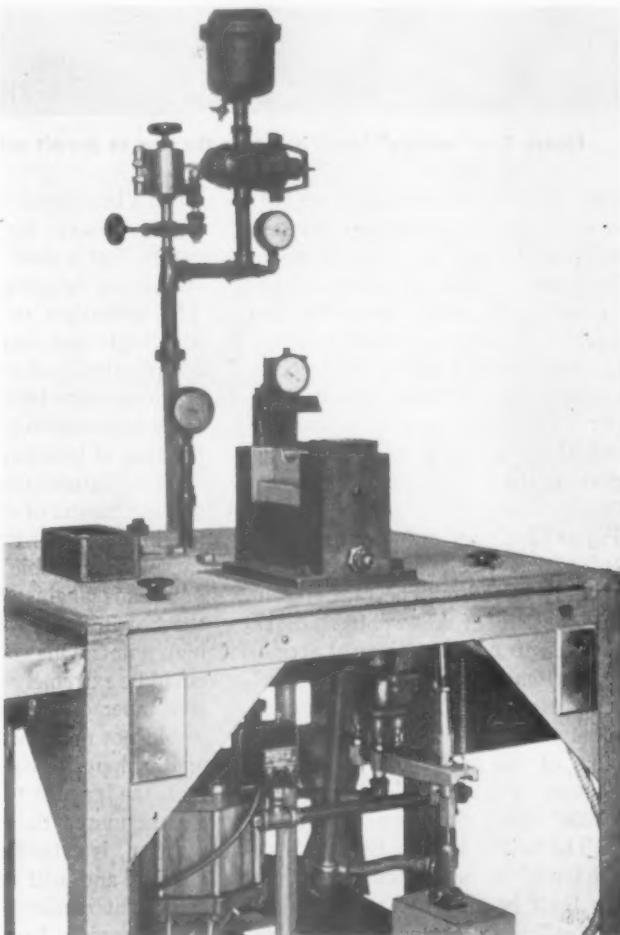
Figure 2, a photograph, shows a commonly used air operated ram or

Figure 1. Earliest gage employed at Allison for checking split-line height.



General Motors'
Allison Division
Photos

Right:
Figure 2. Commonly used air-operated ram for forcing bearing into the steel nest.



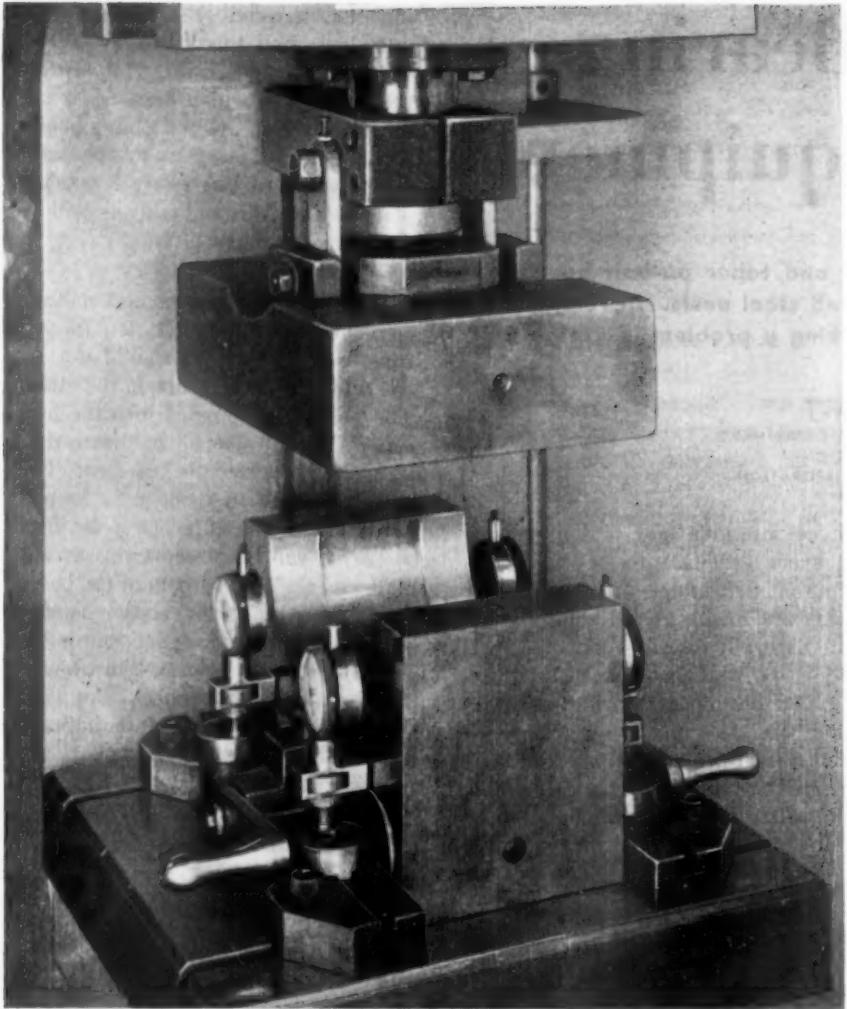


Figure 3. A "wobble" block is put on the ram to permit universal action.

clamp to force the bearing down into the nest. The dial indicator contacts the top of the nest and is set by means of a master, which is placed in the nest and held down by the air operated clamp to a predetermined pressure. This gage checks average height only, no means being provided for checking taper. The split face area can be checked for flatness by blueing and observing the amount of bearing area.

Figure 3 shows a hydraulic press fitted with a steel base carrying the nest and indicators. The ram attachment consists of a "wobble" block suspended to permit universal action. The bottom face of the "wobble" block is lapped flat. The nest block is made to a definite height from the bottom of the half round bore. The indicators are set by bringing the "wobble" block down on top of the nest. The height from bottom of bore to the top of the nest block is less than a low limit bearing so that the indicator readings will always show plus

when a bearing is in place. A master is not necessary for setting the indicators, but a shell type master is desirable for detecting wear in the nest. The technique of determining split line height and taper of faces is rather complicated and confusing to an average operator because it is necessary to do some adding, dividing, and subtracting of indicator readings.

This fixture does not provide a definite means of checking the actual height at each of the four corners, because the "wobble" block presents a flat plane against the joint faces of the bearing and will "ride" on three high points. One corner of the bearing could be extremely low, causing excessive taper on one side, and the gage would not necessarily reveal it. Diagonally opposite corners could be low and the gage would not reveal it. Furthermore, the ram, in working position, is extended too far from its bearing and will deflect, causing inconsistent readings. This type of fixture is rapidly becoming obsolete.

Figure 4 is a photograph of a hydraulic press equipped with a steel base carrying the nest block only. The ram attachment is mounted rigidly on the ram, and is equipped with two "wobble" blocks that rock around a one inch diameter shaft, which lies in a horizontal plane, and is attached to the bottom of the ram head. The indicators are carried on the ram head and are actuated by contacting the top of the nest block and the tops (at one end) of the "wobble" blocks. A master bearing or block is required for setting the indicators. The average height of a bearing is determined by the readings of the two indicators which contact the top of the nest. The taper is determined by the readings on the indicators which contact the tops of the "wobble" blocks. Corrections must be made for these latter indicator readings whenever the distance from the center of the rocker shaft does not coincide with half the length of the bearing. The corrected reading is assumed to be one half the amount of taper in the full length of the bearing.

This fixture would appear to be a decided improvement over the one shown in Figure 3, however, actual results are rather bewildering because of the inconsistency of repeated readings taken on the same bearing. These inconsistencies may result from several conditions which do not remain constant on the equipment; such as a slight lateral movement of the "wobble" block, and deflection of the press ram, caused by uneven distribution of the pressure load on a defective bearing. It has been found that this fixture will repeatedly indicate the height and taper in a bearing, the split faces of which are practically free of taper. However, if excessive taper in the split faces exists it is of an undeterminate amount, in that it is practically impossible to duplicate readings on successive checks of the same bearing. It is essential that the true amount of taper be determined for corrective purposes.

A FIXTURE somewhat similar in principle to the one shown in Figure 2, has the added feature of a "wobble" block mounted on the bottom of the ram which carries a horizontal bar to actuate an indicator mounted at one side. The side indicator is placed at a fixed distance from the centerline of the ram, and with the nest centered on that centerline an

amplified reading for taper can be calculated with respect to the bearing length. The indicator on the ram cover is situated by means of a rod, which is carried downward by the ram. This indicator reading is double the split line height because it is measuring a circumferential distance due to the fact that there is a positive and fixed stop on the other side of the nest.

Indicators must be set by means of a master placed in the nest, and with the predetermined pressure applied by the ram. The pressure varies with each different size bearing, but must be maintained uniformly constant when setting indicators, and checking bearings; this applies on all types of fixtures.

This fixture is slow to operate because the part must be reversed to get a complete check on both sides. Considerable friction is encountered in using this fixture, and must be taken into consideration when determining the amount of pressure to be applied. The surface finish on the nest or a drop of oil in the nest will vary the readings as much as the total tolerance allowed on the part. Extreme care must be exercised in centering the nest in order to get uniform taper readings.

It is more difficult to load this type

of fixture as compared to those which do not have a positive stop on one side of the nest.

This fixture has a dual safety control consisting of two push button switches, which actuates a solenoid operated air valve controlling the air cylinder. It is also equipped with a time delay relay switch to provide a uniform operation cycle.

A NOOTHER fixture similar to the one just described offers an improved method for checking taper. A "wobble" block is mounted at the bottom of the ram, but the front side of the nest carries an attachment containing a "wobble" block also. This "wobble" block rolls or rocks against a series of needle pin rollers in a race that is a true circle, the radius of which has its center on the bottom face of the "wobble" block, thus assuring no lateral sliding motion over the joint face of the bearing being checked. (This design is experimental). This attachment also carries two gaging spindles, which bear directly on the joint face of the bearing, and which actuate the front indicators showing the relative height of the two front corners. The rear indicator on the ram cover shows average height in the same manner as in the first vari-

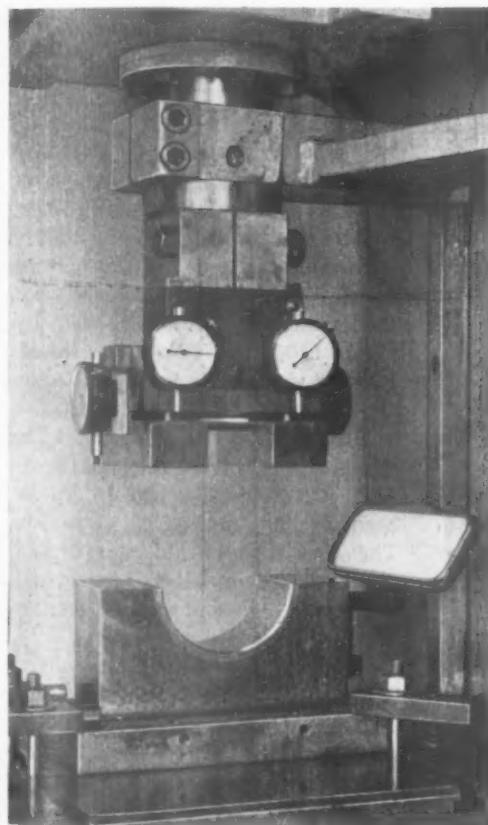
ation on Figure 2.

The fixture is much more accurate and simple to read because no calculations are necessary except to note the difference in indicator readings to determine taper.

To check taper on both sides the bearing must be reversed. This feature slows up production, however, this fixture is highly desirable for short run jobs, because the nests and "wobble" block assembly can be changed from job to job very quickly.

Figure 5 shows the latest development in split line checking fixtures. This fixture consists of a conventional design "Four Post" air operated press. The moving platen is accurately guided by the four corner posts, which are chrome plated, ground, and lapped to fit in the guide bushings. The top surface of the bottom platen and the bottom surface of the moving platen are scraped flat and are made parallel with each other. The guide posts keep those two surfaces parallel throughout the entire stroke or travel.

Mounting details are provided on the bottom platen for holding the nest and stripper. A hardened and ground flat plate carrying two "wobble" blocks is attached to the bottom side of the moving platen. There are four

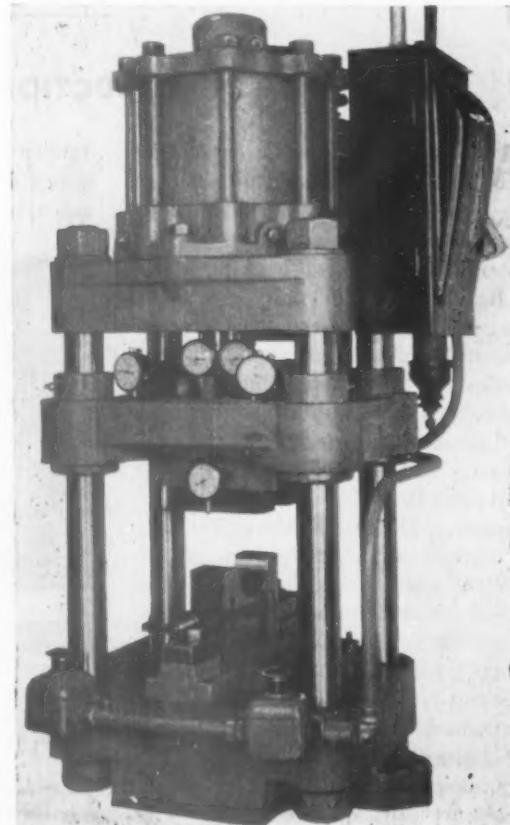


Left:

Figure 4. Two "wobble" blocks are attached to overcome variables in height gaging.

Right:

Figure 5. The latest development in split-line checking fixtures—the "four-poster."



bushings pressed into this hardened plate to provide guides for four gaging spindles, which contact the four corners of the bearing, and which actuate the four indicators that are mounted on the top side of the platen. In order to have all four indicators well out in front it is necessary to use two dial bore indicators to contact the spindles in the rear.

Contacting the top of the nest, the lower indicator checks the average split line height, while the upper indicators reveal the relative height of all four corners.

This fixture provides a rapid means of checking and recording the actual blue print dimension tolerances, because all the checking is done by one stroke of the press; taper can be determined by comparing the upper indicator readings, and the height is read directly on the lower indicator.

All indicators are set to zero by placing a low limit master in the nest and bringing the platen down to exert a predetermined pressure, which is also used to check the bearings.

A solid master which can be measured accurately is made first and fitted to a new nest so that it blues in all over under pressure. This master is used to produce a shell type master, which is made to the size and shape

of the bearing to be checked. This shell master can only be checked for diameter and height in the nest under pressure and by comparison with the solid master. The solid master is retained by the Gage Department and the shell master is kept at the fixture.

Frequent checks are made using the two masters to determine amount of wear in the nest; the solid master will not spread but the shell master will, thus revealing that the nest has "washed" out. Allowance in indicator readings can be made for this wear when it has been determined; however, it is best to re-condition the nest to avoid all confusion and errors. Furthermore, the reconditioning job can be done easier when there is only a slight amount of wear, approximately .0001 on the diameter.

The Four Post press, as shown, is equipped with two push button stations (for safety) which energize a solenoid operated air valve. A time delay relay switch is provided to control the time cycle of the operation. This latter feature was originally thought to be essential to uniform readings between different operators however, experience has proved that this is not necessary. A much simpler installation of a master air valve oper-

ated by means of two bleed valves for pressure stroke and a third bleeder valve for release will be applied to these fixtures, thus eliminating all electrical equipment and service connections. Electrical control can be a nuisance whenever fixtures are moved from one plant to another where current characteristics differ.

Using a cushioned type air cylinder protects the indicators from shock when contacting the work and nest.

A good air pressure regulator valve and a large laboratory type air pressure gage are essential for adjusting and maintaining accurate and uniform pressure. Also a ring type calibrator is needed for setting the pressure to a definite and accurate value.

An air-operated fixture is superior to one hydraulically operated, because much less local heat is generated by the power medium, particularly if the hydraulic power unit is incorporated within the body of the press or fixture. The presence of this local heat in the hydraulic press creates a condition that is not consistent with good practice in precision measuring.

No doubt better fixtures for checking the split line height of bearings will be developed, but right now the "Four Poster" does a thorough, accurate and fast job.

THE END

PRODUCTION TOOL FOR TUBE CLOSURE

AN inexpensive tool for closing tube ends has rated its inventor for citation by President Roosevelt. Simple in design, it has tremendous possibilities for metal-working.

Basically, the old process of spinning is employed, without the internal mandrel which handicapped the old method on production. The new tool consists of a die with a variably sized and positioned opening near the base to carry off heat from friction.

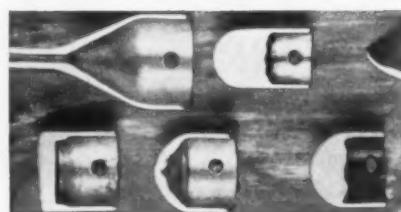
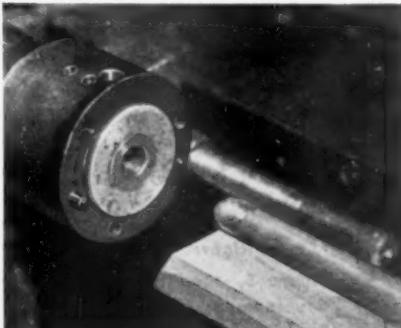
Walter P. Hill of Wolverine Tube Company, Detroit, developed the tool to fabricate from tubing a refrigerant receiver shell which had been produced by deep-drawing sheet. It is adaptable to any machine that will clamp a tube and turn a tool. Use of different sized pins in the end of the die controls the degree of closure, and die shape controls length and contour of necks or flanges. Wall thickness of closure can be more or less than

tubing thickness, depending upon speed and amount of feed. Size of tubing and length are restricted only

by machine capacity. Relatively thin-walled tubing — three-inches diameter with .025-inch wall — as well as thick walls, can be worked.

As tubing is fed into the spinning die (300-1200 rpm depending upon the metal being worked), heat may rise to 1200-1300°F. within a second. Metal is completely annealed and recrystallized to a fine grain structure and is ductile after the operation. The tool is built of high-speed steel, Rockwell 57. Cold-rolled steel, cyanide hardened, has worked on short runs. The tool is applicable for copper, brass, aluminum alloys, magnesium and Dowmetal, and experimentation is near completion on steel.

On a typical brass job, a five dollar tool has shown life of from 50,000 to 250,000 pieces. High production costs have been cut as much as 50 to 75 percent. The tool is economical for job work also.



Increasing the Range of the Turret Lathe

A. E. RYLANDER

MASTER MECHANIC
MIDLAND STEEL PRODUCTS COMPANY

This is the fourth article in a series about metal cutting.

IN the July, 1942, issue of THE TOOL ENGINEER, there appeared a turret layout that, at first blush, might have been a prankster's caricature of tool engineering. Contributed by one Anders Jansson—whatever that elusive chap may be—it described the machining of an awkward casting that, ordinarily, would have been too big for the lathe involved. What interested me was that I had occasion for similar improvising during the early part of the first world war; that, and its practical application to present day problems, prompts this contribution to the ways of doing.

We are constantly faced with production posers that, at first consideration, are beyond the range of available equipment. Then, ingenuity must supplement the machine. And, should the modern crop of tool engineers smile at the improvisations of veterans, I might suggest that modern war production progresses the better and faster for their experience and the practical methods they've evolved. Anyway, the job to be described suggests infinite variety and broad application, not only on turret lathes but on various other machine tools. Through unusual ways we do the unusual jobs, and often better than with orthodox methods.

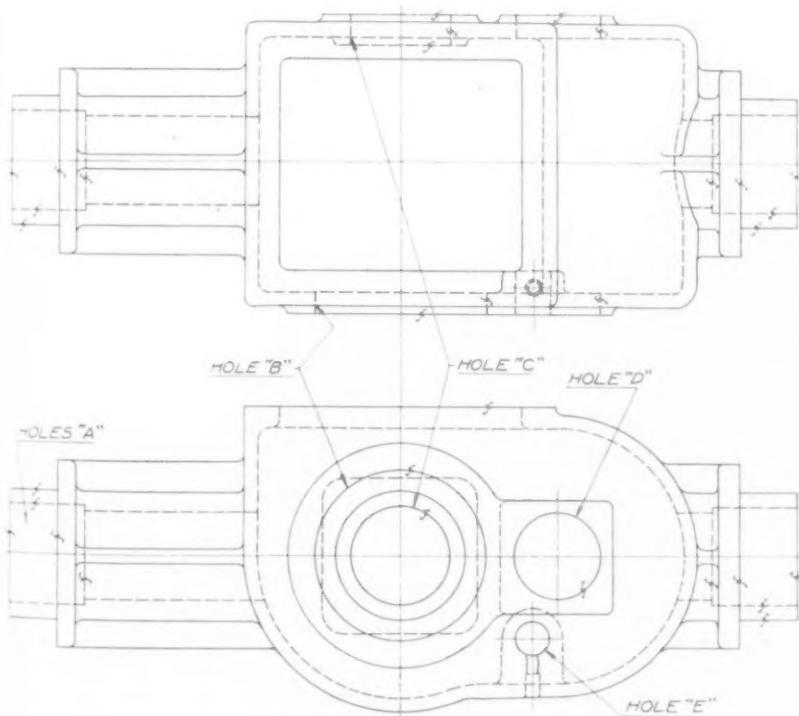


FIGURE 1.

AS NEARLY as can be recalled after a lapse of years, the job—a stub transmission case of malleable iron—looked as shown in Figure 1.

There were two major holes at right angles to the axis, the latter bored and turned at both ends. There was also one smaller hole, for a stub countershaft. The largest hole was stepped, with one inside face, and all three had to be parallel with centers held to close tolerances. The main holes were faced as shown. The overall length, end to end of hubs, was about 30 inches—too long to swing in any of the machines at hand.

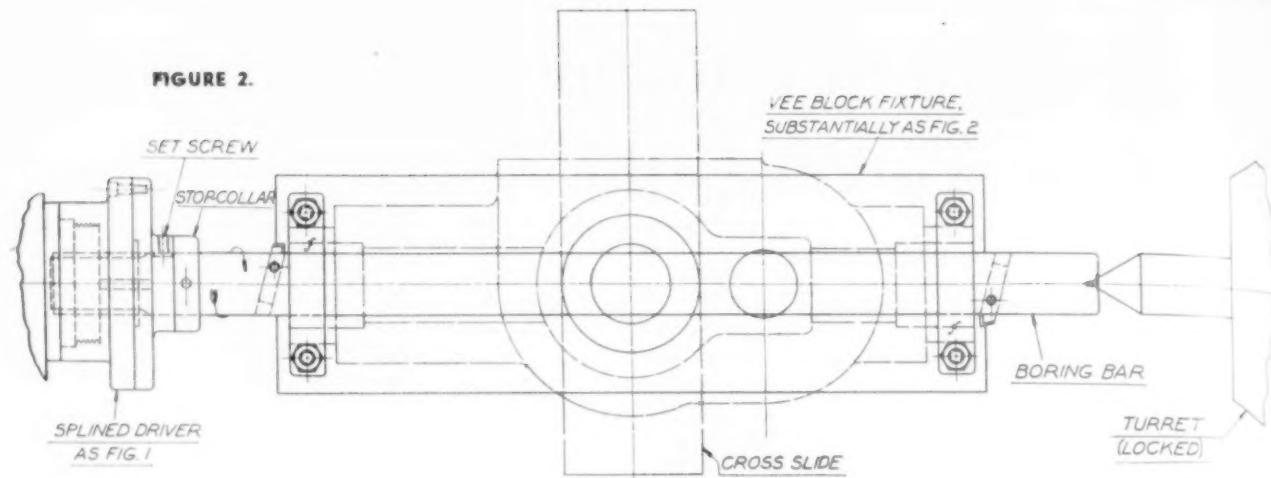
Of course, it was a natural boring mill job, but the nearest was at a remote jobbing shop and quotations were unsatisfactory. Then, as now, there was a fever of activity, with machine tools scarce. Manufacturers vied for equipment of ancient vintage even as, today, we bridge deliveries of new equipment with the production-scarred veterans of World War No. 1.

An old turret lathe, battered but serviceable, suggested a way out, and the job was processed accordingly. Now, obviously, there were tapped holes for cover plate and end bearing caps, but these were later operations and are omitted from the illustration to avoid unnecessary detail.

At first consideration, the finished cover plate pad suggested a location point through dowels or construction holes. However, the close angular relation between axis and cross holes precluded that, since a comparatively slight error in dowel location would have multiplied considerably in the 30-inch length. Consequently, we located from the hubs, nesting them in Vee blocks; in fact, the entire sequence of operations was set up from these points. Accuracy was enhanced by the end location, a point to be considered in modern processing.

A fixture with interchangeable Vee blocks was designed to be set accurately in line with the spindle for the hub boring, and crosswise for the second operation, which was boring the two major holes. This was mounted on the carriage, of which the cross slide had been modified. A splined adaptor, made to take a facing cutter

FIGURE 2.



as well, was mounted on the spindle nose. This provided drive for the boring bars, which rotated in plain bearings mounted on the turret. Today, we'd use precision ball bearings, but they weren't so readily available in those days—at least, not the size we wanted. However, the plain bearings, supplemented with ball thrusts, served nicely with only occasional renewal.

First, then, (Figure 2) we bored the hubs. The bar was slid through the cored holes and the cutters inserted. While not so shown, they were pre-set—*i.e.*, in "cages"—so that there was no jockeying for size. The part was then dropped into the fix-

ture and clamped, and the bar slipped into the driver and locked. The opposite end was guided in the turret bearings previously described. Two passes at each end (rough and finish) completed the bores, after which the O.D.s. were turned in a lathe. When enough had been accumulated, the fixture was swung 90 degrees for the second turret operation, and the Vee blocks changed. See Figure 3.

Center distance of the cross bores was established with adjustable stop blocks. Separate bars were provided for the two bores, also a facing cutter had now been mounted on the adaptor. As soon as the bores were finished, one side was faced by traversing the

carriage, and, because the part had not been disturbed, came out a very close 90 degrees to axis of bore. The part was then turned over, the first finished face squared up and the opposite face milled. No fuss, no complicated tooling, just good production at a cost that wreathed the Old Man's otherwise dour phiz in grins.

The remainder of the operations are so elementary that description is superfluous; for that matter, there's nothing particularly unorthodox in the set-ups described. Just unusual, that's all. But then, if necessity is the mother of invention, the tool engineers are the fathers of unusual but practical ways of getting things done.

THE END

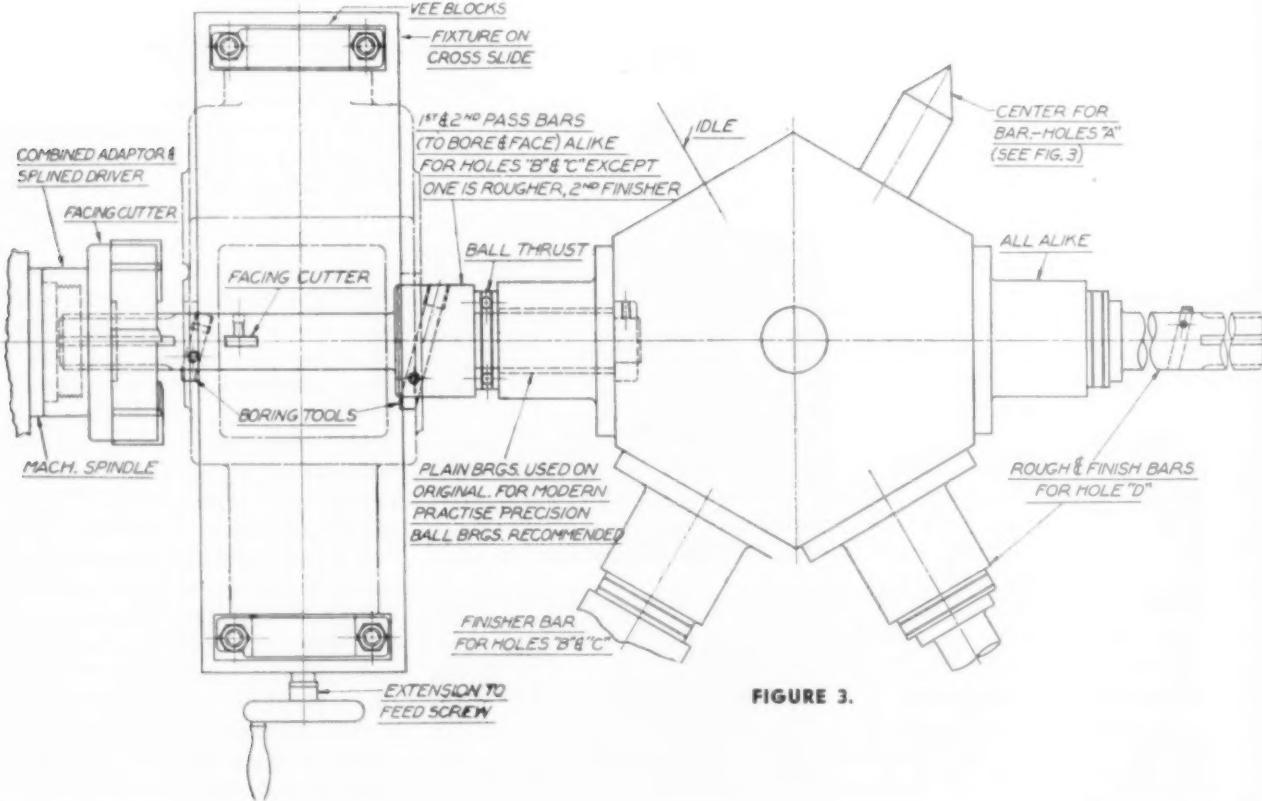


FIGURE 3.

Tool Standardization Benefits Production

As told to Jerome S. Wilford by

A. A. GARNER and JAKE DAVIS

KEARNEY & TRECKER CORPORATION

DRAWINGS BY HOWARD RATHESBERGER
KEARNEY & TRECKER CORPORATION

TOOL STANDARDIZATION, like other means of standardizing or making practice of methods proven superior, can do much to win the production war being waged by individual plants today. An excellent example of a system with far-reaching benefits, yet which can be put into operation without interrupting the flow of work, has been developed by the Kearney & Trecker plant in Milwaukee.

When this company began using cemented carbide tools, multiple tool set-ups were devised for hundreds of jobs, even on engine lathes. Because Kearney & Trecker is in some respects a mammoth jobbing shop, set-ups were changed frequently.

Most lathe jobs do not run more than 50 to 100 parts to a lot. With the expansion of business and the greater diversification or variation in product design, the number of multiple set-ups increased. Between the number of jobs requiring different set-ups and the varied ideas of machine operators as to what tool angles and set-ups were required per job, the cribs soon became choked with hundreds of tools ground every which way — and with no tag marks identifying them with a job. Even with job identification, it would have been next to an impossibility to search through the pile — and at that the operator might not agree with previous judgment in angles. Certainly, there was no reason for him to on a performance basis, in that no record existed of that.

STANDARDS ASSURE PROGRESS

No two ways about it, tool costs were rising. This and other factors led to standardization — from the grinding of the tools from five basic designs to the set-ups for every job in the plant. Standardization by system has taken more than two years,

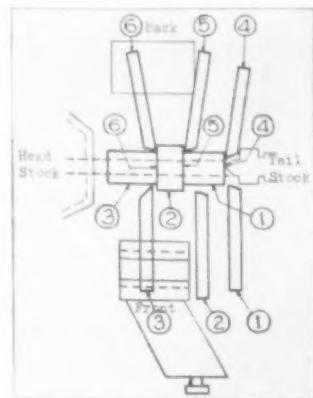
and it does not cover all machine operations yet. It is constantly subject to modification and improvement, but it assures preservation of improved methods. If tools are ground for a certain job today, and the correct angles seem to have been found, that is the way they will be ground for that job six months from now — unless an improvement is found. They will not, because of the whim of an operator, or because of unfamiliarity with the job be ground in a way that produces less efficient results.

Though the system is more than an idea, here is how most of its features have been worked out. When the problem was first attacked, it became apparent that without trying hard there would be 70 or 80 drawings of tool designs with five or six variations on each design. The inventory on this many tools, if the cribs were to stock them, would far outweigh in inconvenience and investment any value the system might have.

The problem was how to cut down on the number of basic designs. In the gear department, where 2,300 different gears are consistently manufactured, this was an important question. It raised such questions as why one job called for a specific tool design and another, not dissimilar job, called for another tool. This question was carried from the shop right back to the engineering department. On necking tools, for example, that department specified varying sizes. Was it necessary? Frequently, in shop and drafting room it was discovered that such specifications were little more than arbitrary, and that one tool design or specification might do the job as well as two or three others.

There were other questions which concerned set-ups. Some gearing jobs called for as many as fifteen different tools. Standardization increased the

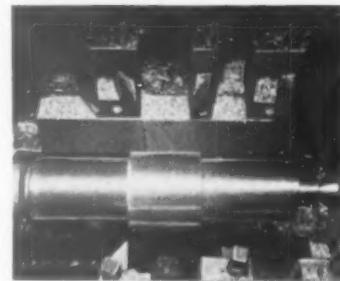
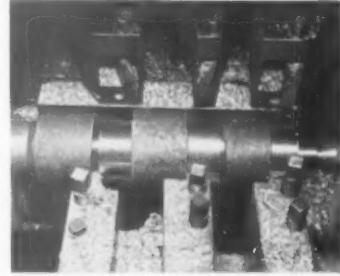
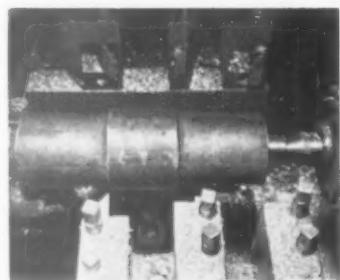
For job work or high production, ready ground tools and specified multiple tool set-ups save time and assure use of best experience.

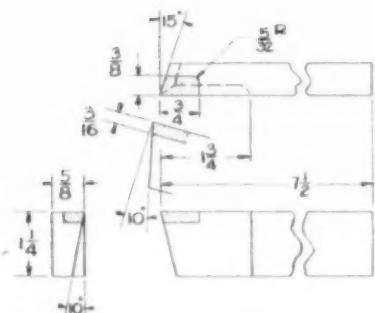


Above, portion of tool layout sheet for rough-turning feed reverse gear sleeve. Tools 1, 2 and 3 turn O.D. Tools 3, 4, and 5 perform facing operation.

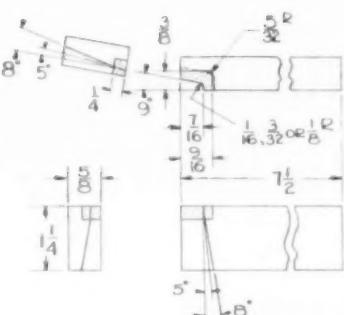
Below—Progressive steps in turning and facing operation of feed reverse gear sleeve.

Kearney & Trecker photos

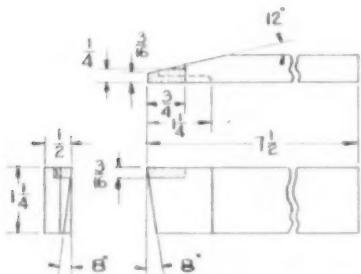




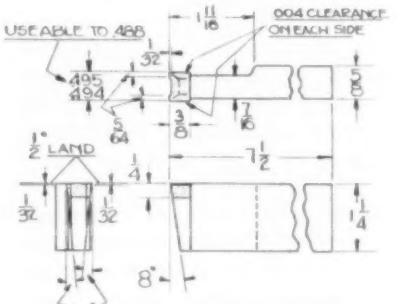
**ROUGH GROUND FORM OF RIGHT
HAND TURNING TOOL - STYLE "A"**
ALSO AVAILABLE AS LEFT HAND



**FINISH GROUND FORM OF 9°
RIGHT HAND RADIUS TOOL - ALSO
AVAILABLE AS LEFT HAND WITH
RADII AS SHOWN - USED TO RADIUS
CORNERS OF CHANGE GEARS**

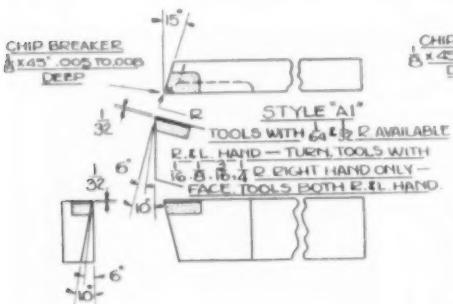


**ROUGH GROUND FORM OF RIGHT
HAND COMBINATION TOOL - STYLE "E"**
ALSO AVAILABLE AS LEFT HAND

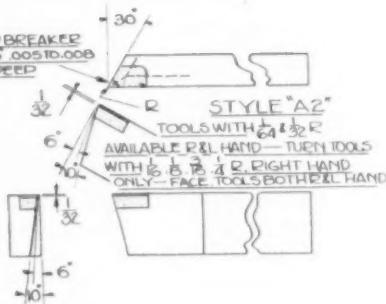


**FINISH GROUND FORM
OF $\frac{1}{2}$ GROOVING TOOL - AVAILABLE
IN 11 SIZES FROM $\frac{1}{8}$ TO $\frac{1}{2}$ BY 16THS,
USED TO SEMI-FINISH GROOVES
FOR SHIFTER FORKS ON CHANGE
GEARS AND CLUTCHES.**

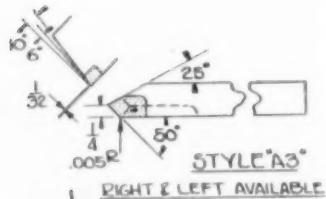
FOUR TYPES OF STANDARD TOOLS



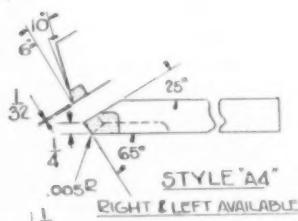
**CHIP BREAKER
 $\frac{1}{8} \times .45^\circ$.005 TO .008
DEEP**
R & L HAND - TURN TOOLS WITH
 $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$ R RIGHT HAND ONLY -
FACE TOOLS BOTH R & L HAND.



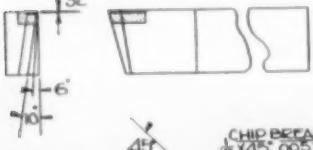
**CHIP BREAKER
 $\frac{1}{8} \times .45^\circ$.005 TO .008
DEEP**
R & L HAND - TURN TOOLS WITH
 $\frac{1}{8}$, $\frac{1}{16}$, $\frac{1}{32}$, $\frac{1}{64}$ R RIGHT HAND ONLY -
FACE TOOLS BOTH R & L HAND



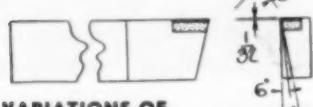
STYLE "A3"
RIGHT & LEFT AVAILABLE



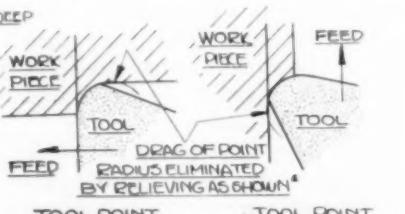
STYLE "A4"
RIGHT & LEFT AVAILABLE



STYLE "A5"
LEFT HAND ONLY



**VARIATIONS OF
STYLE "A" TOOL**



*** TOOLS WITH $\frac{1}{64}$ R & $\frac{1}{32}$ R ARE NOT RELIEVED
AND CAN BE USED FOR TURNING OR FACING**

possibilities for production on gears and cut the number of tools required to eight where fifteen had been used before. Where one batch of gears was turned out on an involved set-up and sequence of operations, several types might now be partially mass-produced on a simplified set-up. Specified finishing operations can then be done by skilled hands on another machine. But, note that more than half the job was done to a recorded process by semi-skilled hand on a less valuable machine.

ONE TOOL REPLACES TWO

How the number and style of tools in general were cut down is illustrated in this way. Tools, ground to a 20° clearance, were being used on certain jobs. On others, 10° were called for. The shop arbitrarily ground tools for both jobs to 15° to see how well this compromise would work. Frequently it worked all the way through. Sometimes, enough jobs came up which seemed to call for a little variation one way or the other to warrant changing the standard, for a few operations or it might be found that the changed standard worked on all previous jobs that had been turned at 10, 20 and 15 degrees.

A large number of jobs might not be completed with a standardized tool, but a standard tool is used to the extent of its ability to approach the desired finished result. In other words, the standard set-up designs make the most use of the standard tools, making them work as far as possible. Individual jobs are then finished to specifications with other prescribed tools, all according to the standard tool layout sheet made out and filed for each job. Thus, as well as standardized set-up and tool angles, a sequence of operations was developed for each job. Every operator is doing the job to the best method which has been discovered in the shop.

The tool layout sheets carry the record of performance and improvement. For example, if for a series of jobs, tool A2 was performing with a 12° clearance and a job came up for which this was the nearest to the correct tool but a 15° angle seemed called for, a new tool might be temporarily set-up as A2 or another tool entered as A3.

As mentioned before, it was frequently found that the 15° tool was also satisfactory for all previous jobs. Thus the scope or range of usefulness

of this class of tool was broadened. The number of tools was not increased in that the old style was discarded.

There are five basic types of semi-finished tool shanks ordered from the manufacturer. These are classified as A, B, C, D and E. These types have variations, 1, 2, 3, and 4, which indicate blueprint specifications. The combination basic letter plus the number is all that is indicated on the tool layout sheet. The operator may not even know what the angles are. He does know that they are the best which shop experience has found. He has no occasion to grind these tools himself. When they are dulled, he returns them to the crib and calls for a new tool. The McCaskey system is employed in checking tools out.

Tool layout sheets which show the set-up for each job, and are filed under the job number, show in free-hand the part on the machine and the relation of the tools to the part. Tools are identified by their number. The layout sheet instructs the operator, or his helper as to what tools he will need from the crib. It shows how the tools are lined up in the tool block — and where the blocks are easily portable, the set-up can be made ready to put onto the machine. Where the blocks are too heavy to be moved easily, the helper can set the tools up in approximate positions in a block beside the machine. The operator can then rapidly set-up his machine. He has a highly developed form of isometric drawing before him and need check only the actual set-up angles against the blueprint. This is important in shops working on a job basis. Set-up time is an important part of production time, when production consists of many set-ups and small runs.

LAYOUT SHEETS SPEED JOB

Layout sheets have also speeded production in that they furnish the operator with the best sequence of operations which has been devised to date. For example, one job on a 16-inch LeBlond turret lathe called for a turning and facing operation. Most lathe operators had been turning the O. D. and then cranking the carriage head back six inches or so to position for the facing operation. One operator noted that by changing the facing tool position, the turning operation could be used to bring the work-piece exactly into line for facing. He made the note on the layout sheet and from then on, this job, no matter who was

running it was performed in the improved manner. The shop did not have to rely on word of mouth to put the improvement into effect.

By lining up the sequence, all the jobs that can be done with a particular set-up are done. There is no loss through changing to a new set-up and then back to a previous one because the operator did not have the whole program in front of him. In this, we can see further benefit in standardization. To lay minds, the idea of standardizing a process is one of freezing it for years to come. Actually, it is one of seeing the whole job, of labeling all the parts and putting them

ment may have a tough job to do, it may be only one of ten individualized jobs and its quirks can be remembered. Previously it was one of all the jobs that department may have had to do over a period of weeks or months.

Tool layout sheets are backed up by blueprints of each standardized tool. These, however, are of little concern to the operator. The tool check-out system employed by Kearney & Trecker where operators sign for specific tools makes a breakage check possible. Thus two checks are possible. If an inordinate number of tools are being broken by an operator, the foreman is told about it. There is fair

Layout sheets show multiple tool set-ups. Lettering on drawing refers to operations sequence and tools listed below.

Ready ground tools are obtained from the crib.

In addition to saving grinding time, set-up time and assuring use of best tool angles, multiple tooling lowers operations time.

On a typical job, 4.92 hours saving per hundred pieces was recorded. This was on operations time alone.

TOOL LAYOUT SHEET		DATE		
PART NAME SPINDLE CO. SHAFT DRIVE GEAR		PART NO. 14037		
MATERIAL SIZE 1615	MACHINIST #2 Vert-E	Gishelt		
		MACHINE NO. 1325 Auto Lathe		
		1/2" Gage		
		SET UP		
		CHECKED BY		
		TOOLING		
		CHECKED BY		
		METHODS		
		CHECKED BY Krueger		
		Front feed 3 1/2 Back feed 2 spp		
Speed change gears 35-40-300 R.P.M.				
TOOL LIST: 4-A1-2(10H) 1-E2-2(10H) 1-E2-2(LH) 1-onectool(1 LH) 1-A1-3F(LH) 1-E3(LH) 1-E5 (RH) 1-A2-2(LH) 1-A2-3F(LH) ABOR: 1.681 TH 1.6825 SPACER: 31/8" min. from face.				
OPERATING		TOOL	R.P.M.	FEED
Backer				
Tool 5 faces A		E1-2(RH)	300	
" 6 " C & necks P		necktool(RH)		
" 7 " E		A1-3F(LH)		
" 8 " F		A1-2(LH)		
" 9 " chamfers B		E2(LH)		
" 10 " L		E2(LH)		
" 11 " faces B		A1-2(LH)		
" 12 " I		A1-3F(LH)		
" 13 " K		E1-2(LH)		
Front				
Tool 1 turns B		A1-2(LH)		
" 2 " D		" " "		
" 3 " G		" " "		
" 4 " J		A5(LH)		
		REMARKS		

in order. Improvement is stimulated by noting the relationship of one job to another. It is also motivated by the fact that the set-up is not just an idea for today, where a few minutes one way or the other may not matter. The very fact of standardization means that over a period of months the job is done over and over, and improvements have real long run value.

On tough jobs, where a certain amount of adjustment and fiddling around are necessary, the system can only go so far. But such jobs have been reduced in number. Memory can be called on to function more accurately now because where a depart-

assurance that it is the operator's fault, and the foreman can generally find out what the man is doing wrong and help him to improve his practice. Breakage records show that this is the general result. On the other hand, if a certain style tool is suffering high breakage by a wide number of men, the tool engineer knows that this standard tool must be modified. It is not suited to a wide range of operations.

All in all, this system amounts to taking advantage of the best of the shop's experience, according to the men who have worked hard in developing the system.

THE END.

"KNOW-HOW" Theme of Milwaukee Meeting

More production, less cost, aims of American Society of Tool Engineers' three day conference and machine and tool exhibit.

OFFICIALS of The American Society of Tool Engineers promise that the Society's combined annual meeting and Machine and Tool Progress Exhibition in Milwaukee, March 25, 26 and 27 will contribute to a greater war production, utilizing less manpower and machine time.

The convention will pivot around the technical sessions which with the exhibition will be held in the Milwaukee Auditorium. Six sessions are scheduled for Thursday, Friday and Saturday. These will be in the form of symposia on labor, tools and tool life, machining NE steels, production techniques and the future of tool engineering.

Among the subjects for discussion are the problems created by increased mass production of both ferrous and non-ferrous aircraft parts, the use of plastic tools, new gaging methods, induction hardening and welding developments which simplify war production. The theme of these sessions—*"Here's How to Know How."*

The Milwaukee meeting will close with dinner Saturday night, at which Brigadier General H. F. Safford, Chief of the Production Service Branch, U. S. Army Ordnance, will be the principal speaker.

Bowing to demands from industry,

the society authorized the 1943 Machine and Tool Progress Exhibition in conjunction with the convention. Because of the contribution which a meeting of manufacturers and tool engineers permitted, the officials reversed a previous decision to sponsor no shows for the duration.

More than 140 exhibit booths have been sold out to 113 exhibitors. One section of the exhibition floor will be devoted to government exhibits.

Otto Winter, national president of the society said: "The problem of simplifying the war production job is so vital that an exhibition of developments designed to simplify or expedite the war production job would be of immediate benefit.

"In cooperation with the Office of Defense Transportation, we are discouraging the exhibition of heavy equipment which would have to be shipped to Milwaukee.

"Our check of tool engineers indicates, however, a desire for a rapid survey of new equipment — tools, accessories, production processes, smaller machines, materials . . . currently available.

This meeting of production equipment suppliers and engineers against an exhibition background is certain to assist in streamlining war production.

Selling in the narrow sense will not be part of this show. But there will be selling of ideas and discovery by tool engineers of what is available to help them do a better job.

Helping the engineer on the production front will be the United States Government, represented by the War Production Board and the War Manpower Commission. In addition to exhibits, they will afford a consulting service. Questions are expected on financing small plants and the controlled materials plan.

NEW TOOLS TO BE SHOWN

Though a minimum of heavy machinery will be shown, manufacturers' representatives will have photographs, prints and literature to help in the search for ways and means of producing more and lowering machine and labor costs. However, as helpful to simplifying production — and particularly for "green" labor — as anything are the thousand and one smaller machines and tools developed to meet the industrial emergency. These will be exhibited.

An entirely new process for assembling aircraft structures will be revealed. A combination of welding and brazing, it works through induction heating according to reports, and requires less skill than either conventional welding or riveting.

A new welding rod which promises to increase the possibilities of tool salvage will be shown.

Cutting tool innovations will include adjustable boring bars and cutters which finish holes to extremely smooth finishes, an expanding keyway broach and a demonstration of high speed carbon tipped milling cutters.

A milling machine company, well known in its field, will present its new line of induction hardening equipment. Speed lathes will be shown with infinitely variable spindles having a 40 to one ratio.

R. R. Nathan, WPB Planning Committee, and Willard F. Rockwell, Chairman of Timken-Detroit Axle Company, discuss new forging process for gear manufacture. It will be revealed at symposium on new production techniques 9 A. M. March 27. Talks on hyper-milling and negative rake, and high speed machining will given at the same session.



Reflections and Horizons

IN its tenth year, the American Society of Tool Engineers has enjoyed the spotlight position of its members' and the institution's importance in war production. The first task of this administration toward increasing working effectiveness was to reorganize committee structure. This obtained greater participation and representation of the members, heightening the value of the national and chapter committees.

There is probably no busier engineering group than The Tool Engineers. They have been credited by men of importance in government and the armed forces with a most significant contribution to the war production effort. This relates not only to their indispensable more than full-time work but also to their extra-curricular activities thru ASTE.

Some time ago a need was indicated for 51 Tool Engineers and Tool Designers for every one available. This tremendous challenge made the fundamental purpose and activities of ASTE of paramount importance. The So-

OTTO W. WINTER

PRESIDENT

AMERICAN SOCIETY OF TOOL ENGINEERS



cietiy was founded to promulgate and disseminate Tool Engineering knowledge. Its technical sessions, its meetings both chapter and national, its

technical papers and standard data sheets, all assumed an accelerated importance.

In mid-1940, ASTE surveyed nationally the need for skilled labor in the metal working industries. A shortage of 1,250,000 machinists, toolmakers, tool designers and tool engineers was indicated. This resulted in the formation of the Defense Training committee as an adjunct to the already existent Education committee. The new committee was to handle the immediate job of getting emergency defense activity underway. Stimulating establishment of defense training classes, members not only served on committees, conducted surveys, endeavored to get industry and school boards together, but actually taught classes. Later they developed a technical advisory service.

Nearing completion is a review of all existing Tool Engineering literature, by ASTE with the commendation of colleges and universities. Today the Society can recommend literature on

(Continued on page 96)

Helping the manufacturer who is seeking equipment for use by unskilled labor or to ease the physical burden on women workers, two suppliers will exhibit new vises. One may be mounted on a machine tool bed to

Axel Lundbye, Chief Engineer, Crowell-Collier Publishing Company, will talk at symposium on Increasing Tool Life, 10 A. M. Friday, March 26.



rigidly support work at any angle. Another, for milling and drilling operations, is hydraulically operated. Hardsteel drills and a supersensitive high speed drill press for small drills may be seen. Metal spray guns for low-melting point alloys, recommended by the manufacturer for filling holes in castings and re-galvanizing will be shown.

In a special exhibit, ASTE-recommended training films, from industry and government, will be shown.

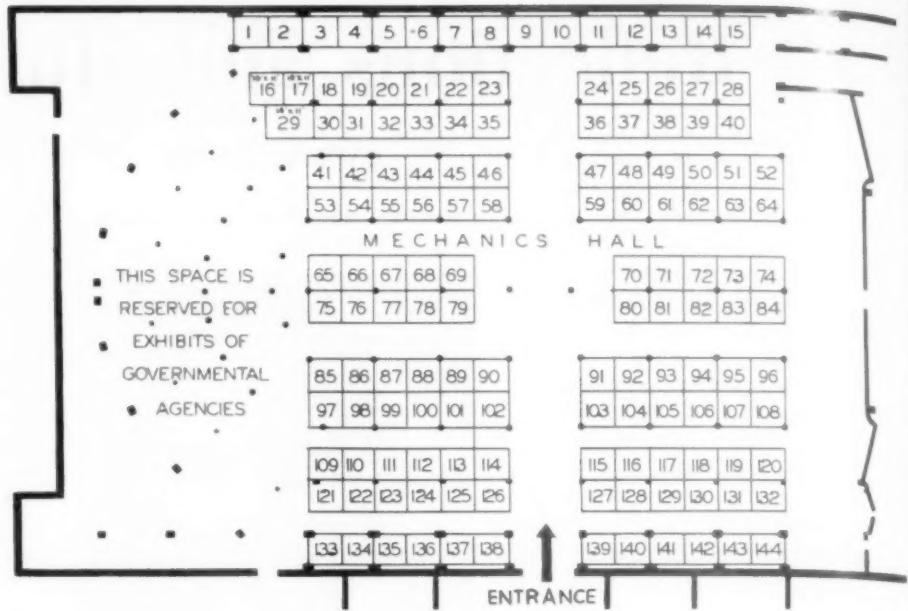
Lawrence Radermacher, President, Stokerunit Corporation, and first Vice Chairman of the Milwaukee Chapter of the American Society of Tool Engineers, is chairman of the Milwaukee Meeting Committees. Adrian L. Potter, Executive Secretary of the Society, is Exhibit Manager. Sub-chairmen include: Harold Heywood, Standards Engineer, Kearney & Trecker, in charge of technical arrangements; Redmond P. Bliss, Vice President, Bliss Bros. Tool Co., in charge of program; Roland N. Nauertz, Tool Engineer, Cutler-Hammer, Inc., in charge of banquet arrangements; Henry

Peterson, Owner, Peterson Tool & Die Co.; J. A. Riedl, Master Mechanic, Flying Boat Division, Nash-Kelvinator Corp.; and Eugene Bouton, Chief Engineer, War Production Board for Milwaukee. THE END.

R. M. Goodsell, Racine Plating Company, speaking on hard chrome plating of tools, will appear with Lundbye and G. Esau of E. F. Houghton & Company.



Directory of Exhibitors at A.S.T.E. Show



BOOTH NUMBERS ARE INDICATED WITH THE NAME OF EACH EXHIBITOR

ALLOY-SPRAYER COMPANY
Detroit, Michigan (Booth No. 120)
AMERICAN MACHINIST
New York City (Booth No. 11)
AMPCO METAL COMPANY
Milwaukee, Wisconsin (Booth No. 10)
ANDERSON & SONS
Westfield, Massachusetts (Booth No. 61)
ANKER HOLTH MFG. COMPANY
Chicago, Illinois (Booth No. 97)
R. B. ANNIS COMPANY
Indianapolis, Indiana (Booth No. 94)
ARO EQUIPMENT COMPANY
Bryan, Ohio (Booth No. 31)
E. C. ATKINS & COMPANY
Indianapolis, Indiana (Booth No. 34)
AUTOMOTIVE & AVIATION INDUSTRIES
Philadelphia, Pennsylvania (Booth No. 2)
BAKEWELL MANUFACTURING COMPANY
Los Angeles, California (Booth Nos. 130, 131)
W. O. BARNES COMPANY
Detroit, Michigan (Booth No. 59)
BLACK DRILL COMPANY
Cleveland, Ohio (Booth Nos. 107 & 108)
BLANK & BUXTON MACHINERY COMPANY
Jackson, Michigan (Booth No. 139)
**HENRY P. BOGGIS & COMPANY and
CLEVELAND TOOL ENGINEERING COMPANY**
Cleveland, Ohio (Booth No. 1)
BOICE CRANE COMPANY
Toledo, Ohio (Booth No. 106)

BOKUM TOOL COMPANY
Detroit, Michigan (Booth No. 5)
BOYAR SCHULTZ CORPORATION
Chicago, Illinois (Booth No. 29)
BRADLEY MACHINERY COMPANY
Detroit, Michigan (Booth Nos. 18 & 19)
BRAMSON PUBLISHING COMPANY
Detroit, Michigan (Booth No. 99)
BRIDGEPORT MACHINES, INCORPORATED
Bridgeport, Connecticut (Booth No. 62)
CHARLES BRUNING COMPANY
Chicago, Illinois (Booth No. 67)
CAPEWELL MANUFACTURING COMPANY
Hartford, Connecticut (Booth No. 142)
CARBOLOY COMPANY
Detroit, Michigan (Booth Nos. 70 & 71)
CARPENTER STEEL COMPANY
Reading, Pennsylvania (Booth Nos. 111 & 112)
**CHICAGO MANUFACTURING & DISTRIBUTING
COMPANY**
Chicago, III (Booth No. 80)
CINCINNATI TOOL COMPANY
Norwood, Cincinnati, Ohio (Booth No. 42)
CONANT TOOL & ENGINEERING COMPANY
Chicago, Illinois (Booth No. 118)
CONOVER MAST CORPORATION
Chicago, Illinois (Booth No. 134)
CONTINENTAL MACHINES, INCORPORATED
Minneapolis, Minnesota (Booth Nos. 49, 50, 51)
DAVIS BORING TOOL DIVISION
St. Louis, Missouri (Booth No. 60)

**DEEPFREEZE DIVISION,
MOTOR PRODUCTS CORPORATION**
Chicago, Illinois (Booth No. 40)
DELTA MANUFACTURING COMPANY
Milwaukee, Wisconsin (Booth Nos. 56, 57, 58)
DETROIT POWER SCREWDRIVER COMPANY
Detroit, Michigan (Booth No. 87)
DETROIT STAMPING COMPANY
Detroit, Michigan (Booth No. 33)
DETROIT UNIVERSAL DUPLICATOR COMPANY
Detroit, Michigan (Booth Nos. 63 & 64)
DEWALT PRODUCTS CORPORATION
Lancaster, Pennsylvania (Booth Nos. 72 & 73)
THE DUMORE COMPANY
Racine, Wisconsin (Booth No. 89)
DURANT MANUFACTURING COMPANY
Milwaukee, Wisconsin (Booth No. 4)
EAST SHORE MACHINE PRODUCTS COMPANY
Cleveland, Ohio (Booth No. 132)
EDWARD BLAKE COMPANY
Newton Centre, Massachusetts (Booth Nos. 95 & 96)
ENGINEERING SALES COMPANY
Sheboygan, Wisconsin (Booth No. 76)
EUTECTIC WELDING ALLOYS COMPANY
New York City (Booth Nos. 135 & 136)
FIRTH-STERLING STEEL COMPANY
Chicago, Illinois (Booth No. 140)
FORD MOTOR COMPANY
Dearborn, Michigan (Booth No. 102)



Left, Frank W. Curtis, Chief Engineer, Van Norman Machine Tool Company, will speak at Tool Engineering Horizons session, 2 P. M., Saturday, March 27. His subject will be "Future Possibilities of Induction Heating."

Appearing on the same symposium with Curtis will be T. J. Thompson, Manager, Industrial Division, Corning Glass Works. Thompson will reveal the latest developments in glass gages, which his company is now manufacturing.



THE TOOL ENGINEER

OPENING AND CLOSING HOURS

The Exhibition will be open to those attending the Annual Meeting and Technical Sessions on Thursday and Friday, March 26 and 27, from noon to 10 P. M. It will be open on Saturday from 10 A. M. until 9 P. M. Thursday's technical session does not begin until evening, leaving the major share of the day open to visiting the show.

MILWAUKEE, THE HOST

This 12th largest U. S. city offers an excellent background for a tool engineering meeting. First in the country for industrial diversification, it has produced some of the largest steel and gray iron castings in the United States, Diesel and gas engines, excavating equipment, electric traveling cranes, auto parts, machine tools.

GAMMONS-HOAGLUND COMPANY
Manchester, Connecticut (Booth No. 35)

GENERAL MACHINE TOOL COMPANY
Seneca Falls, New York (Booth No. 129)

GENESEE TOOL COMPANY
Fenton, Michigan (Booth No. 116)

GORHAM TOOL COMPANY
Detroit, Michigan (Booth No. 90)

GRAY-MILLS COMPANY
Chicago, Illinois (Booth No. 144)

GRINDING MACHINERY COMPANY
Detroit, Michigan (Booth No. 123)

GROB BROTHERS
Grafton, Wisconsin (Booth Nos. 78 & 79)

H. & H. RESEARCH COMPANY
Detroit, Michigan (Booth No. 16)

HAMMOND MACHINERY BUILDERS,
INCORPORATED
Kalamazoo, Michigan (Booth Nos. 47 & 48)

HARDINGE BROTHERS, INCORPORATED
Elmira, New York (Booth No. 32)

HUOT MANUFACTURING COMPANY
St. Paul, Minnesota (Booth No. 75)

IDEAL COMMUTATOR DRESSER COMPANY
Sycamore, Illinois (Booth No. 133)

THE INDUSTRIAL PRESS
New York City (Booth No. 26)

THE IRON AGE
New York City (Booth No. 44)

CHARLES L. JARVIS COMPANY
Middletown, Connecticut (Booth No. 83)

JOHNSON GAS APPLIANCE COMPANY
Cedar Rapids, Iowa (Booth No. 69)

KNU-VISE, INCORPORATED
Detroit, Michigan (Booth Nos. 36 & 37)

KOESEL DIAMOND TOOL COMPANY
Detroit, Michigan, and
STANDARD GAGE
Poughkeepsie, New York (Booth Nos. 7, 8 & 9)

LA SALLE DESIGNING COMPANY
Chicago, Illinois (Booth No. 122)

LINK ENGINEERING COMPANY
Detroit, Michigan (Booth No. 77)

LIPE-ROLLWAY CORPORATION
Syracuse, New York (Booth Nos. 113 & 114)

MADISON MANUFACTURING COMPANY
Muskegon, Michigan (Booth No. 43)

MAJESTIC TOOL & MANUFACTURING
COMPANY
Detroit, Michigan (Booth No. 46)

THE McCASKEY REGISTER COMPANY
Alliance, Ohio (Booth No. 38)

MCKENNA METALS COMPANY
Latrobe, Pennsylvania (Booth No. 84)

MICHIGAN TOOL COMPANY
Detroit, Michigan (Booth Nos. 109 & 110)

MICROMATIC HONE CORPORATION
Detroit, Michigan (Booth No. 68)

NATIONAL BROACH & MACHINE COMPANY
Detroit, Michigan (Booth Nos. 14 & 15)

NATIONAL TOOL SALVAGE COMPANY
Detroit, Michigan (Booth No. 30)

W. H. NICHOLS & SON
Waltham, Massachusetts (Booth No. 22)

O'NEIL-IRWIN MANUFACTURING COMPANY
Minneapolis, Minnesota (Booth No. 81)

PATE OIL COMPANY
Milwaukee, Wisconsin (Booth No. 39)

PHYSICISTS RESEARCH
Ann Arbor, Michigan (Booth No. 82)

PIONEER PUMP & MANUFACTURING
COMPANY
Detroit, Michigan (Booth No. 137)

PORTER CABLE MACHINE COMPANY
Syracuse, New York (Booth Nos. 127 & 128)

PORTMAN MACHINE TOOL COMPANY
Mt. Vernon, New York (Booth No. 52)

PROGRESSIVE WELDER COMPANY
Detroit, Michigan (Booth Nos. 24 & 25)

RACINE TOOL & MACHINERY COMPANY
Racine, Wisconsin (Booth No. 27)

RANSOME MACHINERY COMPANY
Dunellen, New Jersey (Booth No. 3)

RELIABLE TOOL & MACHINE WORKS,
Milwaukee, Wisconsin (Booth No. 17)

L. L. RICHARDS MACHINERY COMPANY
Milwaukee, Wisconsin (Booth No. 141)

DAVID J. ROSS COMPANY
Benton Harbor, Michigan (Booth No. 98)

ROSS OPERATING VALVE COMPANY
Detroit, Michigan (Booth No. 121)

SAV-WAY INDUSTRIES
Detroit, Michigan (Booth Nos. 124, 125 & 126)

SCHAUER MACHINE COMPANY
Cincinnati, Ohio (Booth No. 55)

GEORGE SCHERR COMPANY
New York City (Booth No. 23)

CLAUDE B. SCHNEIBLE COMPANY
Chicago, Illinois (Booth No. 143)

SCREW MACHINE ENGINEERING
Rochester, New York (Booth No. 41)

SEVERANCE TOOL INDUSTRIES
Saginaw, Michigan (Booth No. 65)

SNYDER TOOL & ENGINEERING COMPANY
Detroit, Michigan (Booth No. 88)

STOKERUNIT CORPORATION
Milwaukee, Wisconsin (Booth Nos. 91, 92, 93, 103, 104 & 105)

D. A. STUART OIL COMPANY
Chicago, Illinois (Booth No. 138)

SUPER TOOL COMPANY
Detroit, Michigan (Booth Nos. 53 & 54)

SWEDISH GAGE COMPANY OF AMERICA
Detroit, Michigan (Booth No. 101)

TECHTMANN INDUSTRIES, INCORPORATED
Milwaukee, Wisconsin (Booth No. 28)

ULTRA-LAP MACHINE COMPANY
Detroit, Michigan (Booth Nos. 20 & 21)

VAN NORMAN MACHINE TOOL COMPANY
Springfield, Massachusetts (Booth No. 74)

VASCOLOY-RAMET CORPORATION
North Chicago, Illinois (Booth No. 12 & 13)

VICKERS, INCORPORATED
Detroit, Michigan (Booth Nos. 85 & 86)

WELLS MANUFACTURING CORPORATION
Three Rivers, Michigan (Booth No. 45)

WETMORE REAMER COMPANY
Detroit, Michigan (Booth No. 6)

WHIRLWIND LAWNMOWER CORPORATION
Milwaukee, Wisconsin (Booth No. 119)

WILLIS STUTSON ASSOCIATES
Chicago, Illinois (Booth No. 117)

WILSON MECHANICAL INSTRUMENT
COMPANY
New York City (Booth No. 115)

Professor O. W. Boston, University of Michigan, talks on NE steels, machinability ratings of metals and coolant recommendations, 8 P. M., March 25.



MARCH, 1943



On the Tool Salvage Symposium, 2 P. M., Friday, March 26, L. G. Gorham, Gorham Tool Company, discusses developments of cast high speed weld rods.



H. W. Foegel, Eutectic Welding Alloys, talks on low temperature brazing. A. M. Setapan, Handy & Harman, discusses silver brazing, March 26, 2 P. M.

(Continued from page 93)

10 basic Tool Engineering subjects:

1. Machine Shop Practice and Cutting Tool Design.
2. Jig, Fixture and Gage Design and Practice.
3. Sheet Metal Practice and Die Design.
4. Forging Practice and Die Design.
5. Welding Methods and Equipment.
6. Permanent Molding Plastics and Die Castings.
7. Manufacturing Analyses (A combination of Cost Accounting, Time Study, Work Analysis, Etc.)
8. Foundry Practice and Pattern Making.
9. Heat Treating and Metallurgy.
10. Machine Design and Applied Mechanics.

The latter three are not subjects about which a Tool Engineer should know everything, but he should be able to use them to a degree. Also reviewed are films for use in training.

Another sub-committee of the Education and Emergency Training committee concerns College Training which is arousing interest in the college and universities in teaching Tool Engineering courses. Someday we anticipate that the full four year ASTE course in Tool Engineering will be offered by a number of prominent universities. Other sub-committees deal with training in technical high schools, and Apprentice Training.

TALENT SURVEY PROGRESSING

An important committee is concerned with Industrial Relations. It is handling the current Tool Engineering Talent Survey and the establishment of advisory committees on production problems. In many communities there have been formed, either as ASTE committees or as War Production Board Ordnance committees, with ASTE cooperation and staffing, advisory panels to assist prime and sub-contractors as well as procurement agencies in the technical problems of war tooling and production. The purpose of the survey is to accurately catalog in each chapter the talents and experience and abilities of members who, in an optional and confidential fashion wish to offer their free consulting services.

The Standards committee has promoted and cooperated in the establishment of national standards on machine and tool detail. They have also accelerated activity in ASTE data



At 8 P. M., March 26, William A. Simonds of Willow Run will show a film on women at the Bomber Plant. Dr. B. I. Beverly, Republic Drill and Tool Company, will also discuss women in machine shops.

sheets in the field of supplementary and accessory equipment.

Recently the Standards committee began collecting and compiling material for an ASTE Handbook. It may take two or three years for completion, but, in the meantime, contributions will be printed in **THE TOOL ENGINEER**.

Other national committees such as Editorial, Membership, Publicity, Constitution and By Laws and New Chapters have all done an outstanding job. Area vice chairmen have effectively contributed the liaison between the national committee and the chapter committee. The further step of making the chapter committee chairmen a member of the national committee has completed this chain. ASTE has enjoyed successful national and chapter meetings. Each succeeding national meeting sets a new high for technical sessions and interest. The coming meeting in Milwaukee promises a further step ahead.

The American Society of Tool Engineer's progress is comparable to that of a rolling snowball. Today it has over 12,000 members and 58 chapters throughout industrial America and Canada. Despite this administration's policy of consolidation, membership has increased more than 2000 and four new chapters have been added.

Unprecedented tool engineering developments have speeded production.

In 1942 we produced 48,000 military planes, more than the production of Germany, Italy and Japan com-

bined and in December 1943 we produced 5,500 planes and the rate of production is rising rapidly, as is the quality, weight and fire power of these planes.

These figures from President Roosevelt's message to the 78th Congress bear out his statement "The Arsenal of Democracy is making good."

It is characteristic of the tool engineer to change the product engineer's design toward more practical production. This same procedure has been successfully carried out in armaments manufacture and it has been encouraging to have the cooperation of the branches of the service.

The major portion of the tooling job has been done on standard machine tool, both new and rehabilitated. We can anticipate a transition from general and universal types of machine tools to more specialized equipment. As labor reservoirs are further drained and people of less technical skill are put into industry, it becomes more important to provide highly automatic equipment.

We have been cursed with a shortage of metal cutting tools and at the same time blessed with a lot of ingenious developments in the salvage and repair of broken and worn out tools and in ways and means to increase tool life. There has also been a great development and extended use of special metal cutting materials in the carbide and special cast alloys group, saving high speed steel.

Inspection methods and equipment reflect lessened skill in manufacturing personnel. Greater use of visual inspection equipment is as logical and expected as is that of mechanical "go-no go" gaging.

AFTER VICTORY, WHAT?

We are opening our eyes to new techniques, high speed machining of aluminum and magnesium alloys, and faster machining of ferrous materials.

We will see more use of non-metallic materials in jigs, fixtures and tools.

I firmly believe that war tooling has only begun. Changes and improvements in our weapons necessary to final victory will inevitably call for retooling. Possibly the weapon that will win has not yet been invented.

After victory? I think we will see re-tooling jobs comparable to the job recently completed. Development of myriads of new products, the needs for products, the need for employment, all will have direct bearing on the Tool Engineer.

THE END.

THE TOOL ENGINEER

PRODUCTION DATA SHEET

MILLIMETER-INCH CONVERSION TABLE

LOUIS G. BLUMENBAUM
AMERICAN BOSCH CORPORATION

War production has accelerated the need for a millimeter-inch conversion table. Chief merit of this system lies in its simplicity, accuracy and range.

The range from millimeters to inches is 0 to 999.999mm by increments of .001. The range from inches to millimeters is 0 to 99.999-inches by increments of .0001. Completely comprehensive, the table is set up with relatively few components.

Use of this table can best be explained by actually working out and checking of one of the most extreme conversion problems that may be met in actual practice. Converting 876.543 mm. to inches offers such a problem.

On the millimeter to inch conversion

table, look horizontally along the top line to the column marked 100a. Checking with the extreme left or a/m/m column, follow column 100a to line 8. On this line, is the product in inches of 100 millimeters multiplied by 8—or 800 millimeters equals 31.49600 inches. This process is continued through the tens, units, tenths, hundredths and thousandths places, as shown below.

876.543 mm	31.49600
	.275590
	.23622
	.01969
	.00158
	.00012
	34.50951 inches

Another feature of this table is the ease by which an answer may be reconverted, giving a perfect check on the computation. This feature should quickly establish confidence in the use of the table as well as secure accuracy. The method used in checking is identical with that of the original problem except that the lower table is used.

34.5091 inches	762.00152
	101.60020
	12.70003
	.22860
	.01270

876.54305 inches

Both of the above examples checked out well within the range of practical use.

CONVERSION OF MILLIMETERS TO INCHES

a m/m	100a	10a	1a	.1a	.01a	.001a
1	3.93700	.39370	.03937	.00394	.00039	.00004
2	7.87400	.78740	.07874	.00787	.00079	.00008
3	11.81100	1.18110	.11811	.01181	.00118	.00012
4	15.74800	1.57480	.15748	.01575	.00158	.00016
5	19.68500	1.96850	.19685	.01969	.00197	.00020
6	23.62200	2.36220	.23622	.02362	.00236	.00024
7	27.55900	2.75590	.27559	.02756	.00276	.00028
8	31.49600	3.14960	.31496	.03150	.00315	.00032
9	35.43300	3.54330	.35433	.03543	.00354	.00035

CONVERSION OF INCHES TO MILLIMETERS

b"	10b	1b	.1b	.01b	.001b	.0001b
1	254.00051	25.40005	2.54001	.25400	.02540	.00254
2	508.00102	50.80010	5.08001	.50800	.05080	.00508
3	762.00152	76.20015	7.62002	.76200	.07620	.00762
4	1016.00203	101.60020	10.16002	1.01600	.10160	.01016
5	1270.00254	127.00025	12.70003	1.27000	.12700	.01270
6	1524.00305	152.40031	15.24003	1.52400	.15240	.01524
7	1778.00356	177.80036	17.78004	1.77800	.17780	.01778
8	2032.00406	203.20041	20.32004	2.03200	.20320	.02032
9	2286.00457	228.60046	22.86005	2.28600	.22860	.02286

NOTE: On this page is the seventeenth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

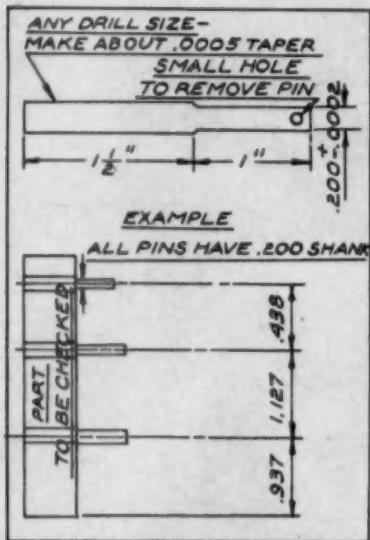
The CRIB*

IDEAS • KINKS • SHORT CUTS

*T.M. REG. U.S. PAT. OFF.

Pins for Checking Drill Jig Distances

A HELPFUL SHORTCUT in checking drill jigs or other tools, where distance of the holes requires checking, makes use of pins built to the most used drill sizes.

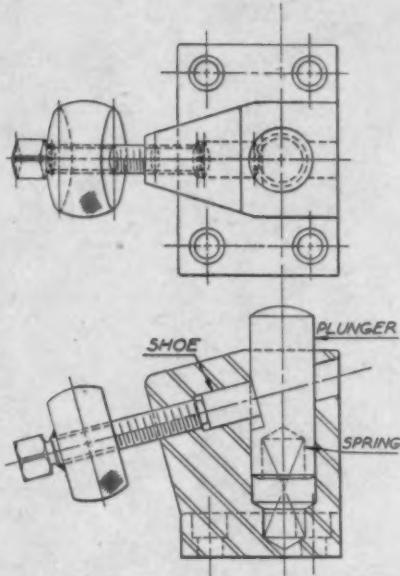


As shown in the sketch, by using these pins, the tool inspectors never need check over odd sizes as the shank in the .200 dimension is used to check over, and the dimensions can be read from height gage as given on drawing.

Improved Spring Jack Always Maintains Pressure

SPRING JAWS have the advantage over screw or wedge types because pressure remains constant during the life of the spring. Hence there is not the variation of pressure or lift, with possible distortion of work, which is an inherent fault of conventional fixture jacks.

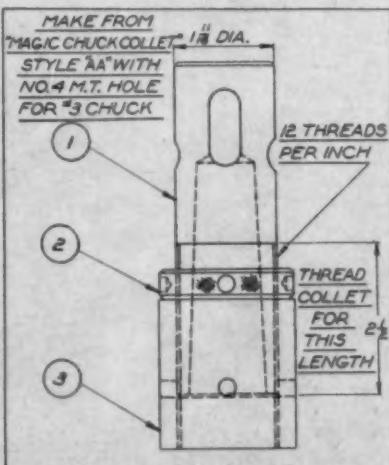
Ordinarily, spring jacks are designed with the screw bearing directly against the plunger and at right angles to the center line. In the modification shown, the screw is at right angles to the taper lock, with a hardened plug or shoe inter-



posed. This enhances accuracy and promises a more positive lock, while eliminating "walk" when the screw is tightened.

Hole Depths Drilled to Close Tolerances

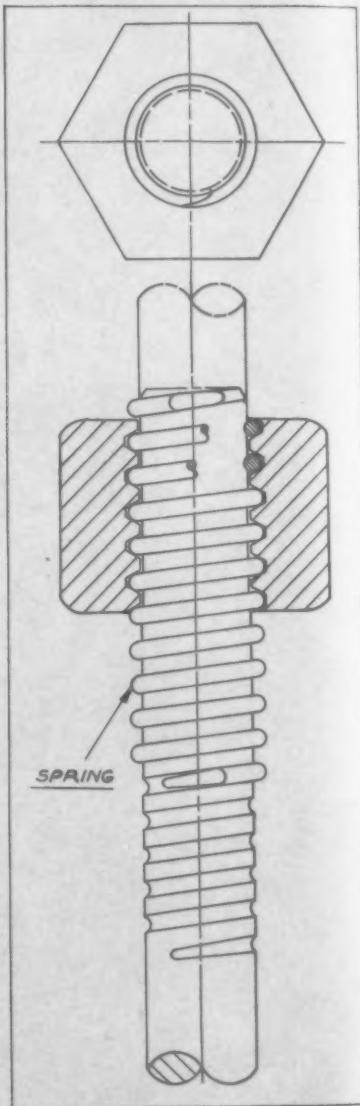
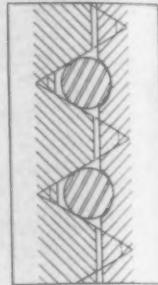
TO CONTROL the depth of drilled holes to comparatively close tolerances, the Q.C. chuck socket (1) pro-



vides all necessary adjustment. A threaded thimble (3), locked with a jam nut (2), bears against bushing head, accurately determining depth.

Steel Springs Used for Threads on a Soft Base

THREADS tapped on a soft base have always presented a wear problem. Steel threads in the form of a spring offer a means of threading such material. Idea is not new, but specialization has withheld circulation.





There's Nothing New in Women Running Turret Lathes

Machine Accuracy Compensates for Inexperience

A QUARTER of a century ago, during the first world war, many women took the places of men at turret lathes. Then, Warner & Swasey employed scores of women as turret lathe operators. In England, thousands of women have worked at machine tools since the start of the war. Now, in America, as more and more men are called into armed services, women are again taking their places in the ranks of machine tool operators.

Under supervision and with aid in chucking heavy parts, women are fully capable of producing good work on Warner & Swasey Turret Lathes. *The extra capacity and greater accuracy built into modern Warner & Swaseys compensate to a large extent for inexperience and lack of finished mechanical skill.* Controls are conveniently located and much of the turning job is automatic.

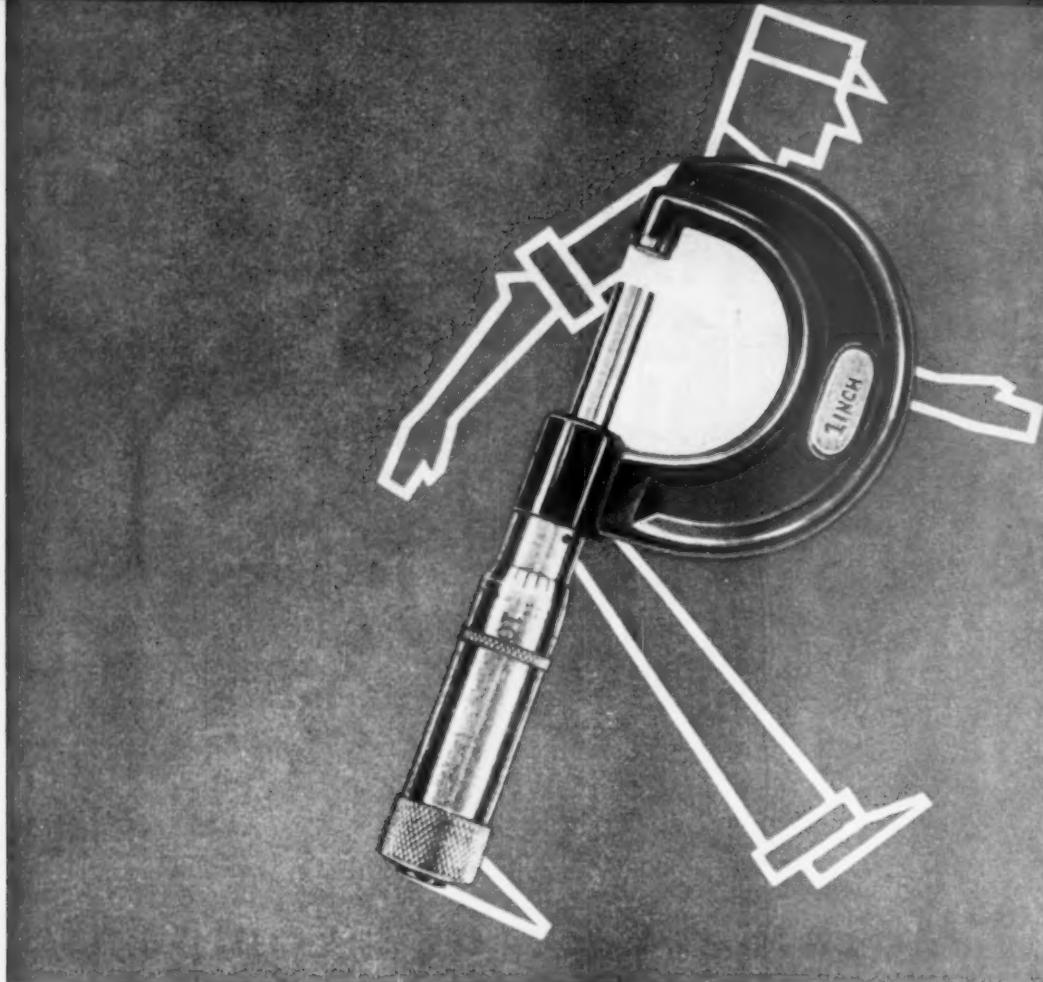
Women can not be expected to fill the shoes of expert machinists, but for the repetitive operations required to produce vital war production, women can be trained quickly to operate Warner & Swaseys with surprising speed and precision.



YOU CAN TURN IT BETTER, FASTER, FOR LESS...
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"**MIKE**" hasn't had a Furlough Since the War began . . .

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You can be certain that both the makers and distributors of Starrett Tools are doing their level best to get them into the hands that are speeding the day of Victory.

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Men, Materials and Machines

METALLIZING in Aircraft Engine Production

H. E. LINSLEY

WRIGHT AERONAUTICAL CORPORATION

THE ART OF METALLIZING is enjoying increasingly widespread use in working industries engaged in war production, particularly as a means of building up worn or damaged parts. One of the nation's largest aircraft engine builders has found it to be of particular value in protecting aircraft engine surfaces from corrosion.

Subject as they are to the most sudden and violent changes of temperature, and liable at any moment to be drenched with rain or salt water spray, the aircraft engine cylinders in par-

ticular are very difficult to protect. The fins surrounding the steel cylinder barrel have a thickness of only .022 inches, while the barrel itself is but .125 inch thick, and it is obvious that if rust is allowed to attack these comparatively delicate parts the results might be swift and serious.

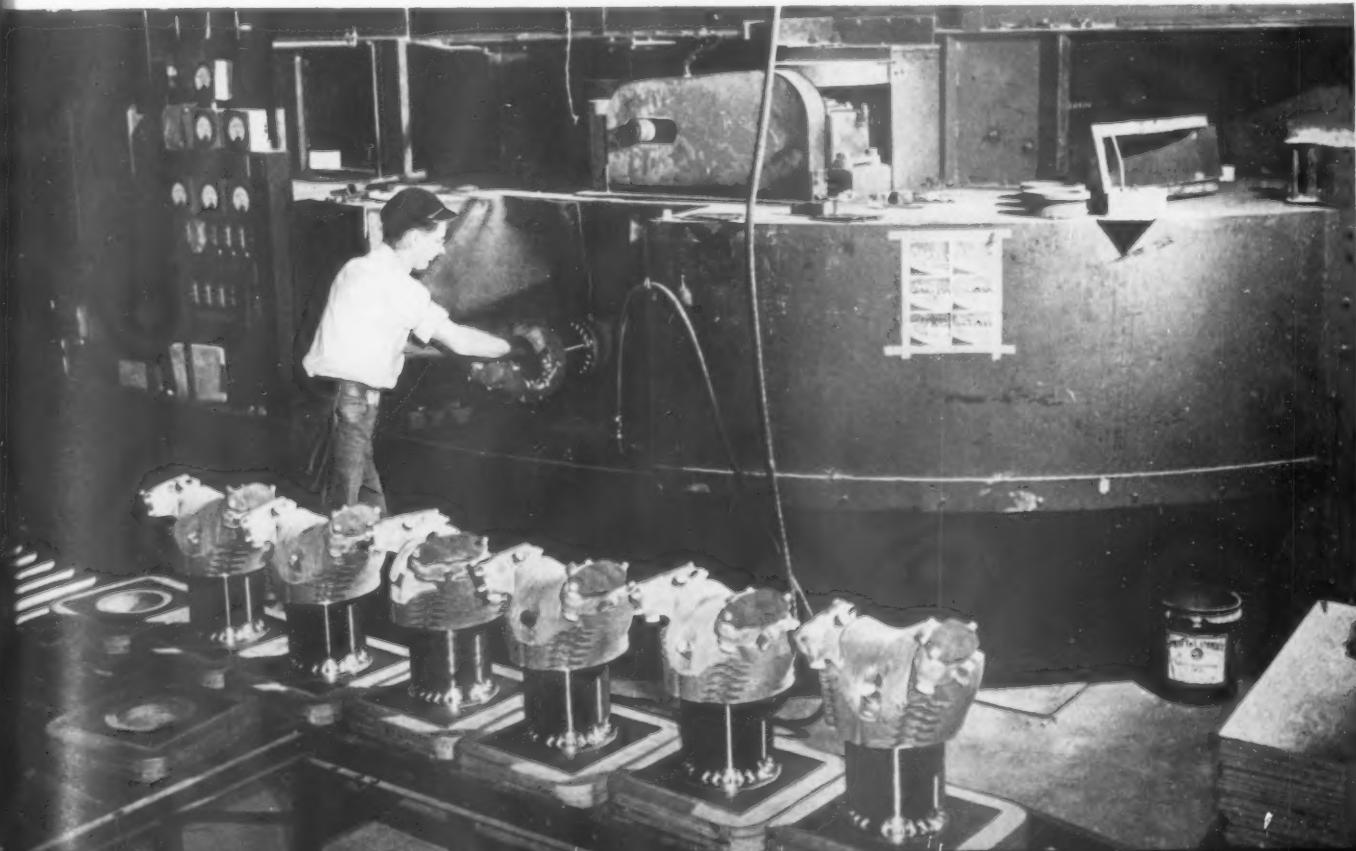
Similarly, the cylinder head, made from aluminum alloy and covered with deep fins little over .0625 inch thick is very subject to attack by corrosion through contact with atmospheric moisture.

Metallizing has proved an ideal medium for preventing corrosion on these parts, but until recently was a

slow, one-at-a-time process. The cylinder was placed on a rotary fixture in a wheelabrator cabinet and traversed by means of a hand crank so that all surfaces were reached by the blast. It was then placed on a power driven turntable equipped with a hydraulic jack. The metallizing spray gun was mounted adjustably on a post and was inclined downwards so that the upper surfaces of the fins would be successively coated as the part rose under the influence of the jack.

At the top of the stroke the angle of the gun was changed, causing it to point upwards and permit coating the lower sides of the fins as the part was

Special automatic Wheelabrator used for grit-blasting Cyclone cylinder assemblies prior to metallizing.



lowered. This took care of the circumferential fins on the barrel and the lower part of the head. To coat the vertical fins and the complicated top surfaces it was necessary to remove the gun from the post and direct the spray by hand.

This procedure was adequate when production schedules were small, but with the advent of mass production and the constantly increasing demands for metallized cylinders it was essential that new production techniques be evolved.

PRODUCTION LINE BASIS

Through close co-operation between machine manufacturers and the methods engineers of the Wright Aeronautical Corporation, a procedure has been worked out for handling the complete operation on a production line basis. Now, less than 8 per cent of the time formerly required is consumed in this operation.

For the blasting operation, a special Wheelabrator was designed by the American Foundry Equipment Co. Entirely self-contained, this huge machine features eight arms projecting radially from a central hub, and rotating within a central housing.

The opening at the front for loading and unloading is shielded with heavy rubber curtains to protect the operators against flying grit. As each arm in



A close-up view of the automatic metallizing machines showing the arrangement of the spray gardens at stations two and three. Wright Aeronautical cylinder assemblies are here being given a coat of pure metallic aluminum.

turn arrives at the loading station a finished cylinder is removed and a new one slides into place.

The finished parts are handled with cotton gloves to avoid contamination of the clean surfaces, since finger prints prevent proper adhesion of the sprayed metal.

The cylinder skirt and the lower face of the flange are finish machined and must not be blasted or metallized. These are therefore protected by a

heavy rubber cuff mounted on the arm. The cuff also serves to hold the part in place and cause it to rotate with the arm. Indexing is automatic, and as soon as the arms have passed through the curtain into the main housing they start to rotate on their own axes so as to present every surface of the part to the blast.

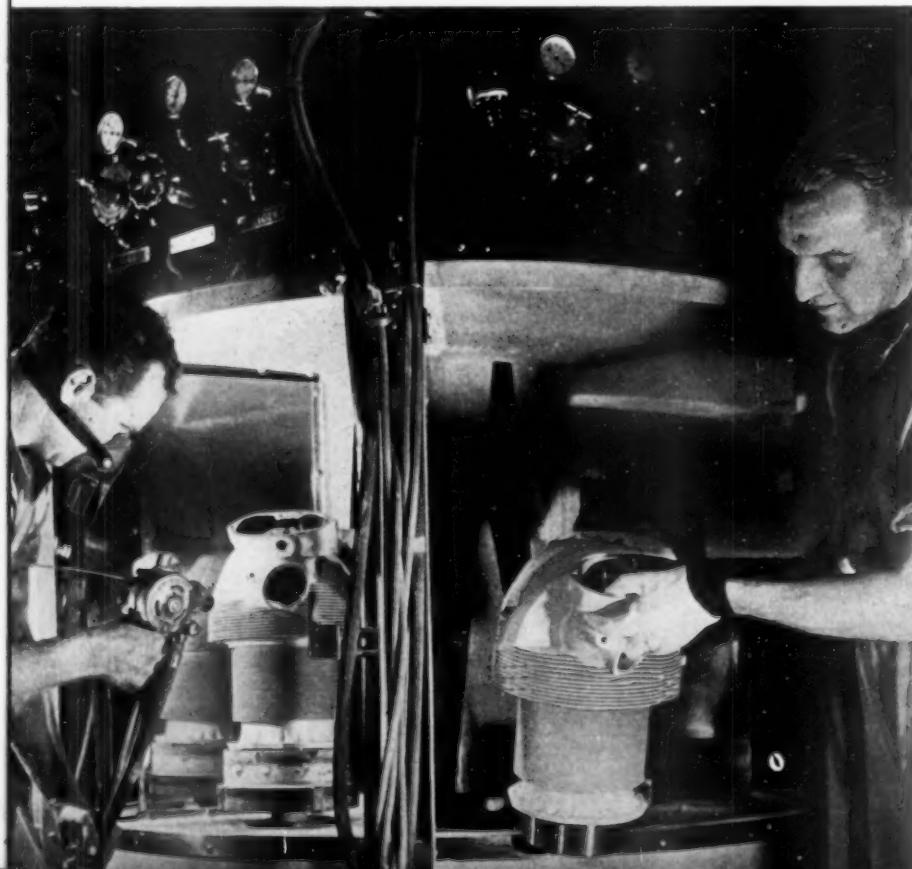
Seven individual centrifugal blasting wheels, one for each station of the index, are set at carefully calculated angles to assure complete coverage of all surfaces regardless of their relative positions.

Experience has shown Wright engineers that optimum results are obtained with No. 20 Alundum as an abrasive, about ten pounds being used per cylinder. This material retains its abrasive properties for a considerable length of time, the sharpness of the grains being maintained despite the breakdown in size.

As the abrasive is used it falls into a hopper at the base of the machine from which it is removed by a bucket elevator, passed through a cleaner to remove the fines, screened to take out metallic particles, and returned to the main supply hopper.

Each centrifugal wheel is driven independently by its own electric motor.

(Continued on page 104)



Operator on right is removing a finished cylinder assembly. White cotton gloves prevent finger marks. Other operator is using a hand operated spray gun for touching up spot missed by automatic guns.

The

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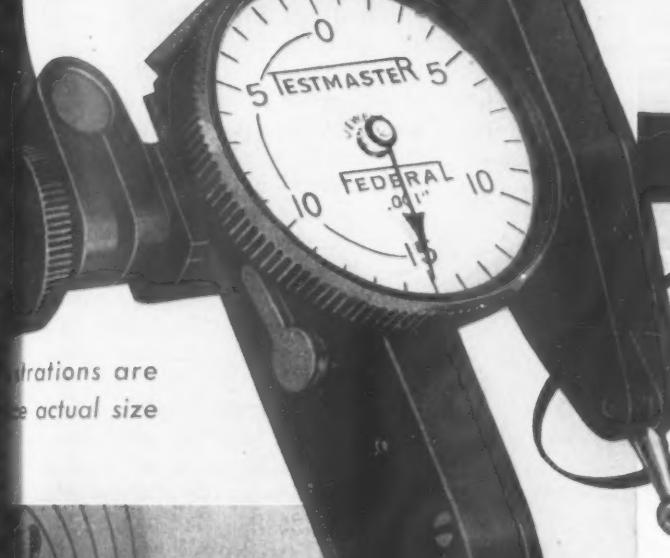
UNIVERSAL

DIAL INDICATOR

with the NEW

INDEX POINT

that locks in place
and sets positively



Illustrations are
not to actual size



For lining up and
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work the Testmaster
is exceptional.

Jewel Bearing

Jewel Bearing

Serrations mesh positively. Interchangeable point locks on pivot. Low friction bearings.

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and inertia — greater accuracy.

You get more quality features
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The Testmaster universal test Indicator is chock full of detail features that you will appreciate more and more as you use it.

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PRECISION MEASURING INSTRUMENTS

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(Continued from page 102)

Since the load on each motor is directly proportional to the amount of abrasive passing through it, an ammeter connected to the motor serves as an accurate indicator of the amount of abrasive being used. The seven ammeters are mounted on a panel in full view of the operator and enables him to tell instantly if the supply to any wheel should be interrupted.

Cylinders are delivered to the machine by a roller conveyor system, and after blasting are again carried by conveyor to the metallizing machine, cotton gloves being used for handling.

The metallizing machine is located immediately in front of the grit blasting machine, and is connected to it by a horseshoe shaped conveyor which provides storage space. A roller-top table is installed between the arms of the conveyor to form additional storage space. This storage is necessitated by the fact that the cycle on the blasting machine is purposely made slightly

shorter than that of the metallizing machine so that there will always be a reservoir of parts and the metallizer will not need to be shut down if temporary delays occur on the Wheelabrator.

The metallizer was constructed especially for the Wright job by the U. S. Galvanizing and Plating Equipment Corporation in collaboration with the Metallizing Corporation. It is so designed that the metallic coating will be applied evenly to the full depth of the deep, closely spaced fins by locating the spray guns at exact angles impossible to maintain with hand operated guns.

It comprises six stations, each controlled by reduction gearing and fully adjustable to various speeds. At the first station the parts are loaded into a fixture which supports and centers them.

The machine then indexes automatically to the second station where the part rotates at a predetermined speed

Fully machined and metallized Cyclone cylinder barrels pass through the machine shop on a roller conveyor on their way to the final inspection.



while a spray gun mounted on a hydraulically operated post and inclined at a specified angle moves upwards so that the spray of metal coats the lower faces of the fins. At the end of the stroke the angle of the gun changes automatically so that on the down stroke the upper surfaces of the fins are coated.

The next index brings the part in front of two guns similarly mounted but at fixed opposing angles, and these too pass up and down to spray the upper and lower fin surfaces.

HAND GUN FOR TOUCH UP

Station four is similarly equipped with two spray guns so arranged as to spray the side surfaces of the cylinder head only, while at station five a hand operated gun is provided for manually spraying the complicated upper head surfaces.

Station six is used for inspection and unloading. A hand gun is available here for touching up small spots.

Commercial illuminating gas is used as the heating medium, being brought to the desired pressure by a small two-cylinder compressor. Oxygen is supplied through a pipe line from a bank of oxygen bottles coupled to a manifold system in a different section of the plant.

A separate compressor, independent of the general plant air supply provides compressed air for the spray as well as for driving the wire feed rolls housed within the body of the guns. This air is freed of all moisture by passing it through a special drier.

A set of gauges for gas, air, and oxygen is provided at each operating station to permit the individual regulation of each gun. An exhaust system connected to the top of the machine removes the fumes. As an added precaution the operators wear respirators to avoid the danger of breathing in the minute particles of sprayed metal.

The metal used for spraying is pure aluminum wire which, unlike alloys of aluminum, is highly resistant to corrosion.

The standard requirements for a sprayed part are that it shall show no signs of corrosion after exposure to concentrated salt water spray for 250 hours. So effective has this method proved that specimens have been tested for as long as 700 hours without showing any deterioration.

THE END

GORTON PANTOGRAPH DOES 5 OPERATIONS ON INDEX PLATE... with Unskilled Operator



GORTON

**2-DIMENSIONAL PANTOGRAPH
ENGRAVING MACHINE COMPLETES OPERATIONS
FROM SOLID STRIP MATERIAL IN 1½ HOURS**

Multiple operations on large runs of duplicate parts can be handled quickly and accurately on Gorton Pantograph Engravers. On this job the manufacturer uses Gorton Single Flute High-Speed Cutters operating at 9,200 r.p.m., and maintains an accuracy of $\pm .0015''$ while profiling. The remainder of the operations are performed with a $\frac{1}{4}''$ diameter straight shank cutter running at comparable speeds.

The brass index plates made from

Army-Navy "E" Award
for Outstanding Excellence
in War Production.

$\frac{1}{16}''$ strip material come to the Gorton Pantograph Engraver with three drilled and countersunk holes. The operations performed are shown on the front and back views of the completed plate.

In addition to work of this nature, the Pantograph Engraver may be used for engraving dies, molds, dials, flat and curved work, and other general engraving, profiling and lettering work.

Gorton Engineers, specialists in engraving, die, mold and stamp cutting, and super high-speed milling, will be glad to make recommendations on your work—without obligation.

PANTOGRAPH DATA

MACHINE—Gorton 3-Z Pantograph Engraver.

PART—Index Plate.

MATERIAL— $3/16''$ Engraver's Brass.

QUANTITY—300 Pieces.

CUTTER— $\frac{1}{4}''$ dia. Straight Shank Single Flute End Mills.

OPERATION—Engraving, Marking and Profiling complete from solid strip.

HOLDING—Special Jig with "T" Slot Clamp.

FEED—Manual.

SPEED—Top Speed—9200 r.p.m.

TIME— $1\frac{1}{2}$ Hours Complete.

ACCURACY— $\pm .0015''$.

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covering Gorton Pantograph Engraving Machines and Attachments. Also covers other Gorton engraving machines for special purposes.

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"The REPRODUCING Machine People"





Bell Aircraft Photos

SCRAP CONTROL at Bell Aircraft



Machinings from the floors are run through a centrifugal dryer to salvage the mineral oil clinging to them.

Fourteen types of aluminum alloy are used at Bell. This worker is shearing scrap left from a press operation.



Mass producer of the famed Airacobra, the Bell Aircraft Corporation is a big consumer of vital materials. Likewise, it is a leading exponent of scrap salvage and material substitution to relieve shortages.

IN 1941 the potential output of this nation's metal producing facilities far exceeded the consumption of its metal fabricating industries. With the swing to all-out war production, raw metals in numerous categories soon became so critical that material shortages posed a serious impediment to increased war output.

Today, the situation is eased somewhat—but only because the steel mills and aluminum plants are working around the clock, and numerous metal fabricators are turning back tremendous quantities of scrap.*

Many a producer of steel products might well look to the aircraft industry for lessons in scrap collection. The highly productive salvage methods developed in this still youthful industry deserve serious consideration by other manufacturing fields.

Bell Aircraft Corporation, mass producer of the famed Airacobra is a leading exponent of salvage for victory. In addition to setting up a separate department which serves as a clearing house for all "waste" material in its plants, this concern is continually studying the possibilities of substituting less critical materials in fighter plane manufacture.

The principal materials collected by the Bell scrap control department are

*Nonetheless, WPB reports the scrap situation just as critical today as it was three months ago when THE TOOL ENGINEER featured a special section on scrap salvage methods.)

Small parts swept up from the floors at Bell are sorted, inspected, cleaned and returned to stock by this department. A hundred sorting operations are required before all the types are segregated.

many types of aluminum alloy. Carefully marked with identifying code, scrap cans for 14 different types of aluminum alloy used are strategically placed throughout the company's plants. This sorting in the manufacturing plant reduces the time required in the smelter, since extensive tests to discover the types of material may be omitted. Because of the constant movement of the scrap to the smelter daily, new sheet stock in which this scrap is used may be back in the shop within five weeks.

CUTTING OIL SALVAGED

Besides aluminum, many other metals are controlled so that every pound of scrap goes back to the smelters. Machining operations on heavier parts of the plane produce copper, brass, bronze, lead, zinc and magnesium scrap. Valuable plexiglas is saved, to be used for injection molding. Aluminum rivets which are dropped during assembly operations are swept up. Inasmuch as they cannot be used in production, because flush rivets used on aircraft skins have a hair edge that is very easily damaged, they are sent to a vocational school where men and women are being trained for the aircraft assembly lines.

One of the most interesting phases of this salvage work is the processing of all machinings through a large centrifugal dryer, which salvages hundreds of gallons of mineral oil still clinging to the particles of metal.

A large staff of employees is constantly engaged in sorting Army and Navy Standard parts, following a regular sorting routine in reclaiming these parts. Several hundred operations sometimes are necessary before the job is completed. Many small parts—electrical or hydraulic fittings, screws, and nuts—are found in this work. The sorted parts are sent to inspection, after which they are returned to stock, or are scrapped.

MATERIAL SUBSTITUTION PROGRAM

Every possible effort is made by the company's engineering department to find substitutes for critical materials now in use. Felt, and several synthetics are being used in place of rubber.

Neoprene, which was developed to replace rubber, has now become a critical material. In one instance, a substitute for neoprene is being used. Complete investigations are being made of the plastics available, and these are being used wherever possible.

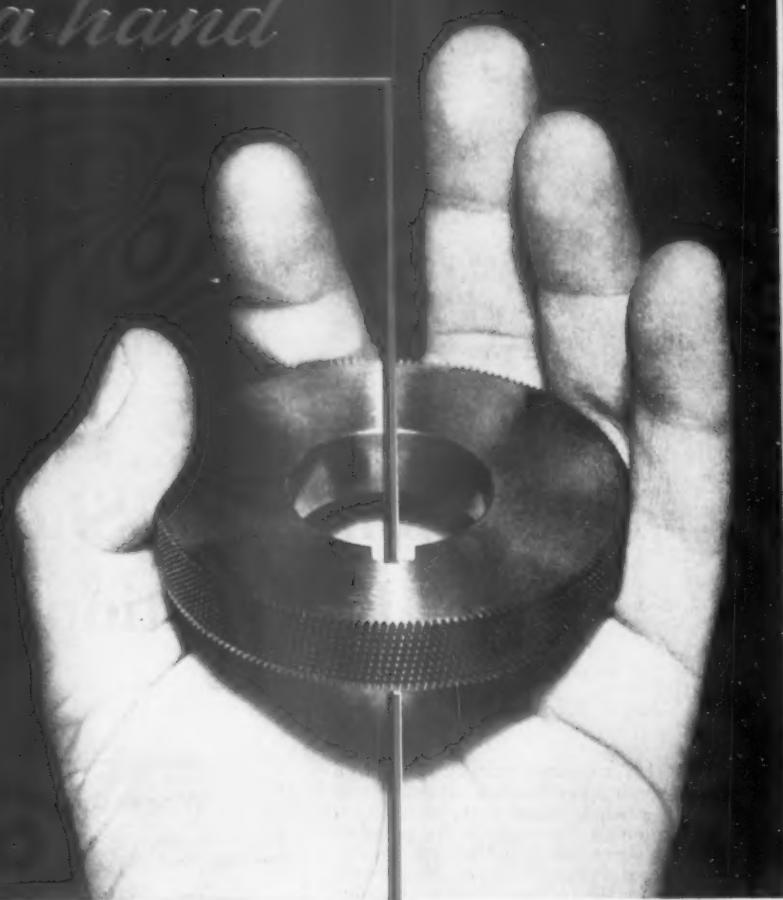
Considerable work has already been done in the substitution of low-carbon steels for stainless steel, which is now difficult to obtain.

In cooperation with the government, this research work will continue until as much critical material has been released as is possible without impairing the quality of the fighting ship this concern is producing. Bell is fully cognizant of the fact that material substitution is fully as important as salvage in solving the critical material problem today.

THE END.

THE TOOL ENGINEER

6000 GEAR CUTTING TOOLS in the palm of a hand

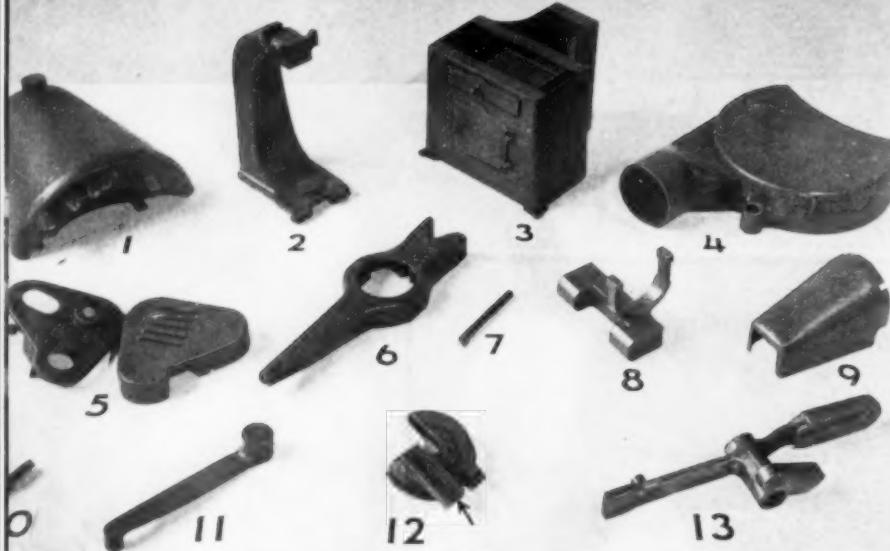


There are—to be exact—64-8 accurately ground and sharp cutting edges on that particular Michigan rotary gear finishing cutter (*). Each cutting edge acts like a separate cutting tool and does its own share of the work in finish-machining gears.

That's one reason why you can produce gears so accurately and so fast on Michigan Crossed-Axis gear finishing equipment. It makes no difference either, whether your gears are $\frac{1}{4}$ inch in diameter or stand many feet high: there is a Michigan Gear finisher for every size class.

* The illustration shows an average cutter (64-pitch; 10° helix angle) for the new Michigan 861 light duty gear finisher (see small cut), designed for gears from $\frac{1}{4}$ to 4 inches in diameter.

MICHIGAN TOOL COMPANY
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Norton Company Photos

Development in Sheet Steel Fabrication

C. A. REHNBERG

ABOUT a quarter century ago, a well known New England abrasive and grinding wheel manufacturer set up a department to investigate the possibilities of sheet metal fabrication in machine tool industry. That department is now considered a necessity in building machine tools — as indicated by its growth from one man to 195.

It started fabricating small parts that posed difficult casting problems. In ensuing years there has been gradual development so that belt guards, gear guards and larger parts are now made. Cast iron guards, weighing up to 600 pounds — a chain fall and three men had been needed to assemble them on a machine — were replaced with sheet metal guards weighing only 175 pounds and costing a quarter of the cast part. That saving was made 18 years ago.

Fitting of guards to special machines is a current problem. Changes in machines under assembly, such as putting in different speeds or motors, means remaking the guards to conform with the changes. If cast iron were used, the loss in time and money in making both new patterns and guards would be extremely high, compared to the few minutes involved in remaking sheetmetal guards.

Practically all of the guards are made by hand. Press tools cannot be used much because there are so many different machines and a large amount of material would be wasted.

The Sheet Metal Department often has been called upon to fabricate parts for special machines and parts that normally would be supplied from foundries. They have handled several "rush" orders on welding, planing, drilling and milling jigs.

Many parts are made in the Sheet Metal Department in cooperation with the Engineering Department. This arrangement has brought about savings

Confronted occasionally with the problem of drilling hard cast iron and hardened steel, this department developed a special drill for that purpose (No. 7 in photo). If, for example, a 5/16-inch hole is to be drilled, a 5/16-inch piece of Haynes No. 1 (Black Label) welding rod could be used as is, without welding to any drill rod or cold rolled steel. A smaller rod than the drill itself, should always be used to allow space for chips to be released from the hole being drilled. For example, a 3/16-inch or 7/32-inch rod should be used with a 1/4-inch drill.

The speed for a 1/4-inch drill should be approximately 3200 rpm, slightly faster for smaller size drills, slower for larger ones. For 1/4-inch and smaller drills Haynes Stellite No. 1 (Black Label) welding rod could be used as is, without welding to any drill rod or cold rolled steel. A smaller rod than the drill itself, should always be used to allow space for chips to be released from the hole being drilled. For example, a 3/16-inch or 7/32-inch rod should be used with a 1/4-inch drill.

No. 12 in the photograph is a wheel guard made from 3/8-inch to 5/8-inch stock with sizes varying from 15 to 45 inches in diameter. Steel brackets, weighing up to 65 pounds were formerly used on these guards. They required milling on one side to get the bracket straight, drilling and counter sinking of bracket and guard to match; rivets had to be heated before the bracket was riveted to the guard.

Weight Comparison of Cast Iron and Sheet Steel Parts

Below are comparison weights of parts made of cast iron and sheet steel as illustrated in photo.

PART	SHEET STEEL (POUNDS)	CAST IRON (POUNDS)
1. Gear box cover	5	15
2. Truing device	No difference in weight, but less aluminum is used.	
3. Grinding machine base	325	825
4. Wheelguard with dust collector connection	7	23
5. Belt guard	40-600	90-3000
6. Table control lever	3	6
9. Truing device	1	3

Below are the parts made of fabricated machine steel which were formerly produced by the foundry

- 8. Shifting fork
- 10. Automatic stop
- 11. Connecting rod
- 12. Wheel guard
- 13. Reverse lever

No. 7 is a drill used in the drilling of hardened steel and cast iron.

in time and material. Men working on machines discover methods that make it easier to assemble the parts or fabricate them using less steel. Suggestions of this type are referred to the Engineering Department and upon their approval are put into effect.

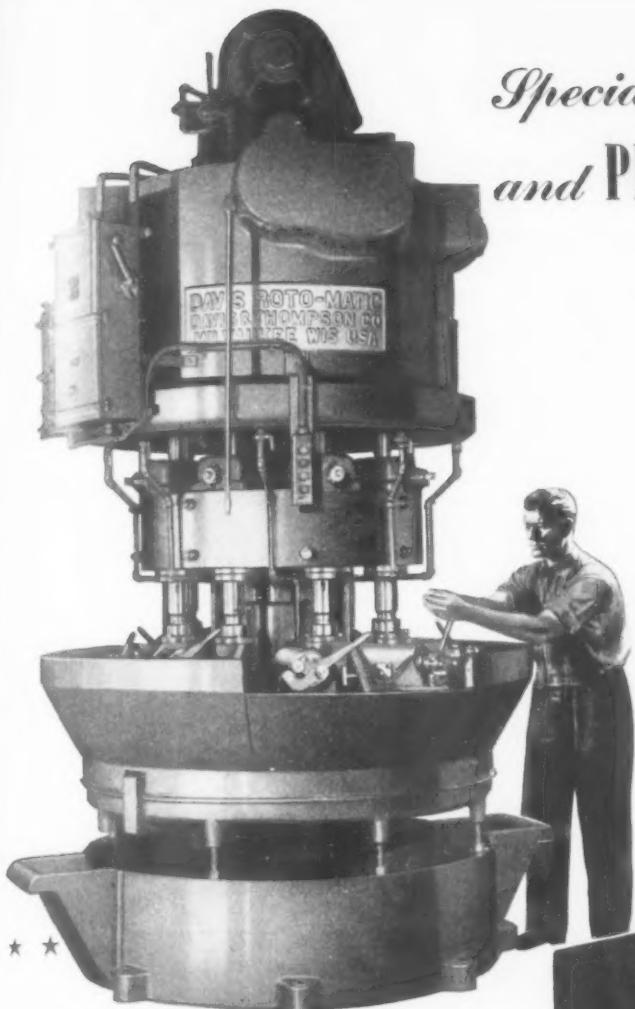
One feature that appeals to the men on this job is the variety of work. They make small clips, handles, knobs, pans, fuse boxes, splash guards, wheel guards, gear guards, belt guards, bases. They have to wrestle with sheets of steel and cut, nibble, bend and weld them.

This had a tendency to make the guard look rough as compared to the one piece fabricated bracket now being made and welded to the guard (see arrow). The present set up makes it possible for the Engineering Department to add one splash cover to prevent splash on machine bearings and floor.

The saving in weight and cost of machine steel (35 pounds to cast steel 65) is considerable and the machine steel product is a finer finished part.

THE END.

Started as an experiment, a machine tool builder's metal department has proved its worth. Paradoxically, a major contribution is a drill for cast iron and hardened steel.



Specially Designed for the SPEED and PRECISION Victory DEMANDS

High-speed, automatic precision machines designed and built by Davis & Thompson engineers are helping many metal-working manufacturers meet the demands of Victory production.

Multiple spindle milling, drilling, boring machines created by D & T for specific jobs, combine many machining steps into fast, automatic operating cycles, in many cases producing hundreds of precision parts *per hour* at speeds never before considered possible. These machines...so simple, automatic and accurate that even semi-skilled operators can maintain peak production records...conserve critical materials, precious time and vital manpower. High production at low cost will continue to be our aim throughout "the duration" and on into the post-war era.

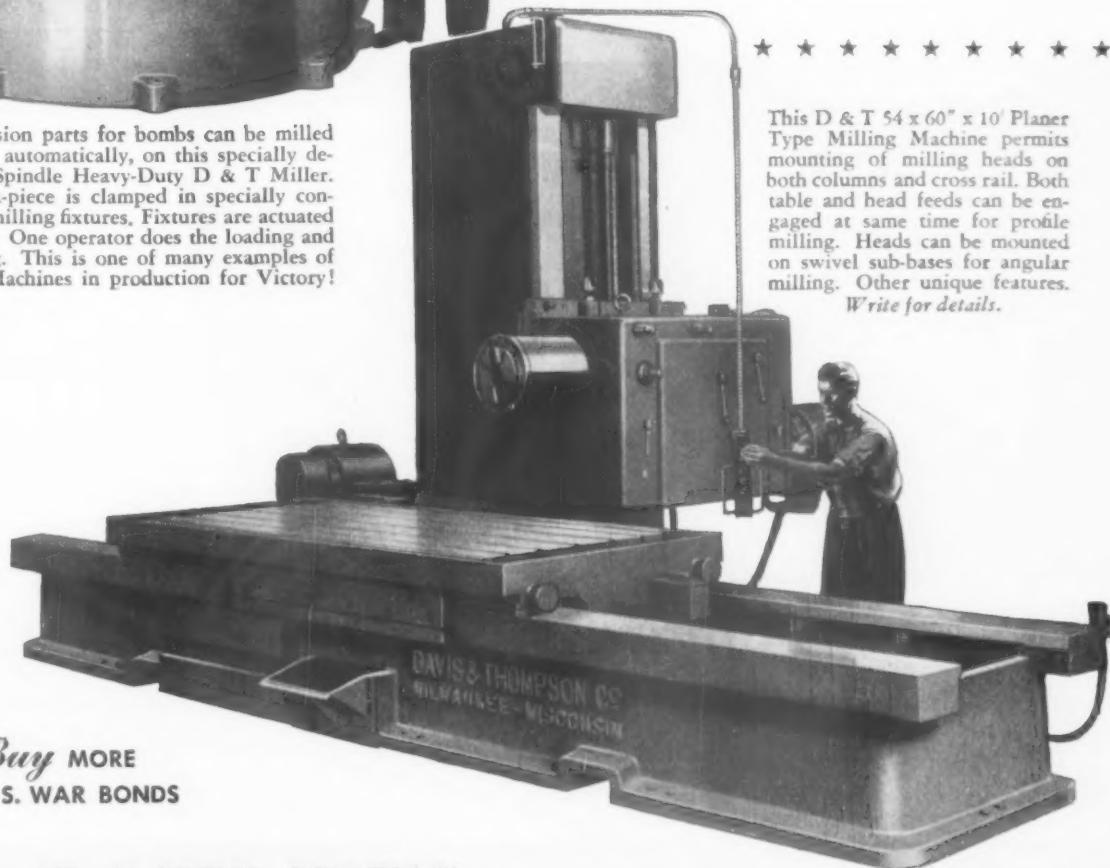
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480 precision parts for bombs can be milled per hour, automatically, on this specially designed 8-Spindle Heavy-Duty D & T Miller. The work-piece is clamped in specially constructed milling fixtures. Fixtures are actuated by a cam. One operator does the loading and unloading. This is one of many examples of D & T Machines in production for Victory!

This D & T 54 x 60" x 10' Planer Type Milling Machine permits mounting of milling heads on both columns and cross rail. Both table and head feeds can be engaged at same time for profile milling. Heads can be mounted on swivel sub-bases for angular milling. Other unique features. Write for details.



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CAPITAL, COMMUNIQUÉ

T.M. REG. U.S. PAT. OFF.

JAY A. BONWIT

Washington Correspondent for
THE TOOL ENGINEER

CONTROLS over war production are going through a crucial and final stage, with the next three months likely to tell the story of whether the War Production Board will continue in a dominant role.

The three months will be a showdown period. WPB Chairman Donald Nelson has indicated that he is no longer willing to placate the armed services on the question of controls. On numerous occasions, recently, he has let it be known that he intends to get tough.

Concentration of authority in WPB Vice Chairman Charles E. Wilson removes all question of choice.

The general belief is that the battlefronts this spring and summer will require a constant flow of munitions, and production must meet the battle requirements.

If production does not meet expectations, changes will be quick and final. WPB will bow out to another organ-

ization. Civilian controls will pass over in a large degree to the armed forces.

The problem of materials supply has eased considerably. Shortages still appear, and will continue to appear for some time, it is believed.

There are shortages in certain shapes and forms of aluminum castings, alloy steels, etc. However, by and large, the material problem is fairly well in hand.

There are two reasons for the easing in supply. First is that curtailment in civilian usage has been effective in releasing large tonnages for essential requirements.

Second is that the WPB Requirements Committee has brought supply and demand into fairly close relationship.

There is general agreement that supplies will be sufficient only for strictly essential needs, and that no relaxation in controls is likely.

The forecast is for further "squeeze"

on the economy to cut down on the fat and some of the meat. Civilian manufacturers will face rock bottom. Action to bring about further cuts will probably wait on more active participation in battle, when need for such further cuts will become more apparent.

Manpower is the most complex problem facing the Government. The facts are that the military services will drain off more physically fit and trained workmen, who will have to be replaced by women, and older men who are untrained.

War Manpower Commission is seeking means of supplying Army and Navy demands for men, and at the same time keep industry going.

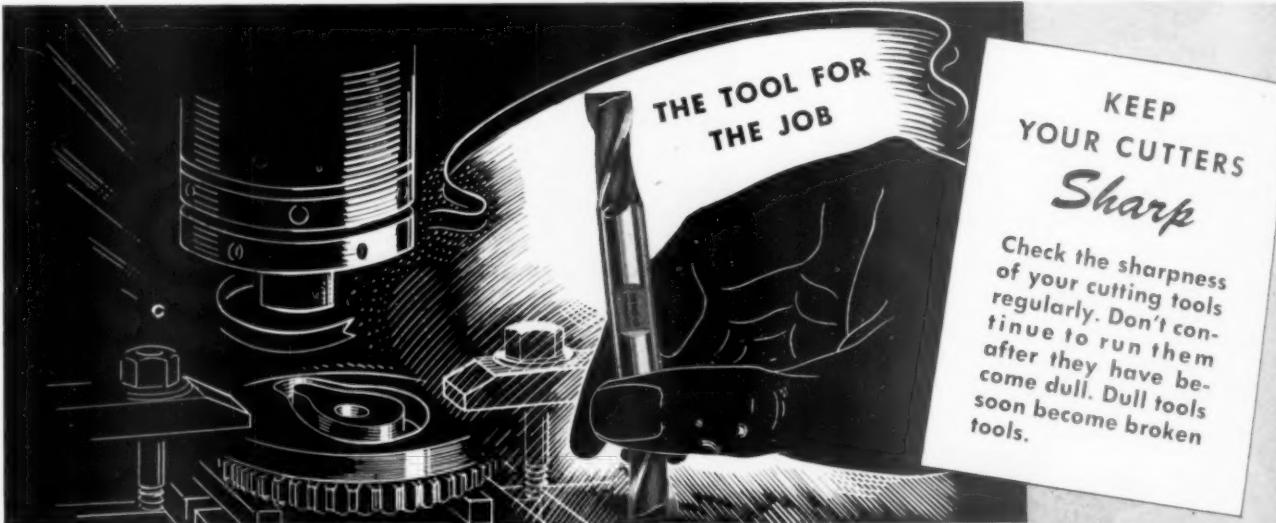
To complicate matters, the politics of the labor issue are particularly complex. Labor organizations oppose the use of force by the Government to conscript labor. Every effort is being made to coerce labor by voluntary means. With the ranks of labor divided and with Government policy undefined, there is a likelihood that the muddle will continue until a crisis develops, when legislative and stringent Government controls may be necessary.

* * *

Subcontracting is again becoming a major issue. Appointment of Col. Robert Johnson as WPB Vice Chairman in charge of the Smaller War Plants Division was made in a new effort to keep smaller plants in operation.

The effort to increase subcontracting will be concentrated on getting the co-

(Continued on page 112)



A Putnam Hi-Speed End Mill

always provides maximum speed in cutting, making possible exceptional finishes with the milling operation alone. Putnam

End Mills, on any job, can be depended upon for minimum breakage—a guarantee of full production efficiency in milling.



PUTNAM TOOL COMPANY

2985 Charlevoix Avenue

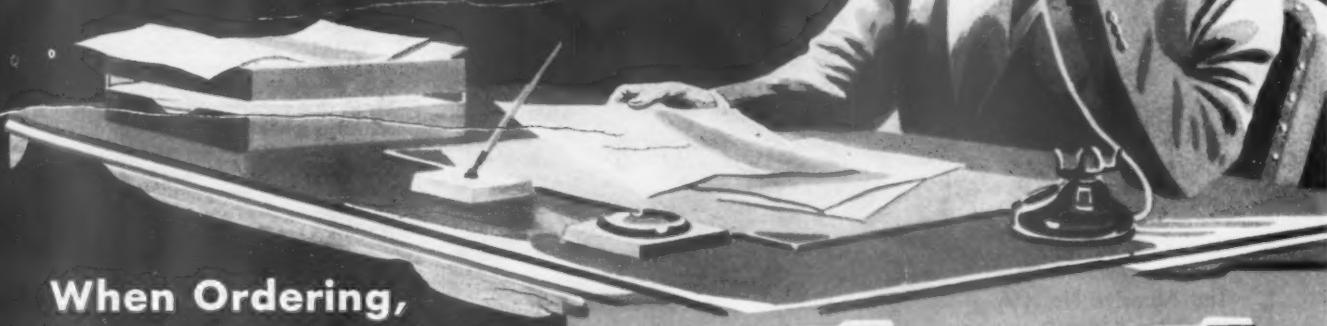
Detroit, Michigan

THE TOOL ENGINEER

SNAP GAGES? We Can Ship Today!

Sheffield has a complete stock of AGD Adjustable Snap Gages in all models and in all ranges—for immediate shipment.

Every one of these gages has been made to Sheffield's high standards of quality in both materials and precision workmanship.



When Ordering,
Be Sure to Give All the
Following Information:

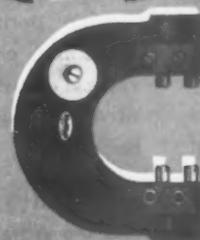
State Frame Model and Frame Size. Stipulate whether gage is to be set and sealed (allow additional day on orders for set and sealed gages). Give complete marking instructions if set and sealed.

FOR SPECIFICATIONS

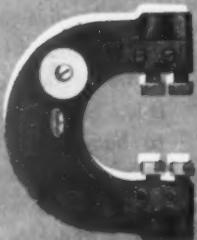
SEE SHEFFIELD

HANDBOOK No. 42-2

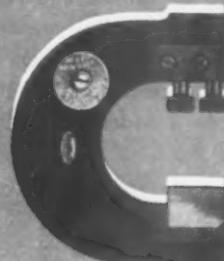
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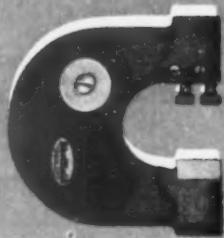
AGD MODEL A



AGD MODEL SR



AGD MODEL SC



AGD MODEL SMC

THE **SHEFFIELD** CORPORATION
DAYTON, OHIO, U. S. A.



(Continued from page 110)

operation of the Army, Navy and Maritime Commission purchasing officers and the purchasing agents of industry.

Colonel Johnson maintains that it is good business for purchasing agents in industry to spread the business. He indicates that if it is good practice for industry, it is good practice for Government.

There will be cases where the Government, through the Smaller War Plant Corporation, assumes the prime contract and subcontracts the job.

This approach will be reserved for unusual instances. The greatest emphasis will be placed on selling the idea of subcontracting to industry and Government.

Changes in war production program schedules, increase in operating efficiency and development of new production techniques have resulted in idleness of some machine tools.

To permit such tools to be transferred to some other user so that they can be put to work in war production, the Army, Navy, WPB and Defense Plant Corporation issued a joint declaration of policy in the form of a directive permitting transfer of idle tools. The action applies principally to tools which have been purchased through Government financing.

The policies governing transfer of machine tools are:

1. The WPB may direct the transfer of any machine tool not in use or from

use on any contract, purchase order, program, or other work regardless of ownership or contractual rights relating to the possession or use of such machine tool, to use on any other contract, purchase order, program or other work in the same plant or another plant.

The direction of the WPB will be addressed to the departments or agencies primarily affected and a copy shall be furnished to the holder of such machine tools.

2. The Tool Division of the WPB shall issue such a direction only after consultation with the War Department, the Navy Department or any other Government agency or department the performance of whose contracts may be affected by such action.

Consideration shall be given to the effect which such transfer will have on respective production programs, under the general policies directed by the Production Executive Committee.

3. The guiding principle shall be that upon the issuance of such a direction the transfer of the machine tool in question shall be made promptly. Accordingly, every effort must be exerted by the governmental agency concerned to obtain the consent of the holder of the machine tool to the immediate transfer.

Adjustments between government agencies necessitated by the transfer and likewise negotiations between such agencies and the machine tool holder with respect to the modification of any contract under which the machine tool is used or of any contract for the production of material with such machine tool shall, insofar as possible, be conducted after the transfer.

4. If the consent of any private interest deemed necessary to the transfer of the machine tool cannot be obtained, or if the transfer is not accomplished with reasonable dispatch, the WPB will issue such orders as may be necessary to effectuate the transfer.

When necessary, the machine tool shall be requisitioned pursuant to the Act of October 16, 1941, as amended.

5. Reserves of machine tools retained by contractors against the possibility of future need for tools shall not be permitted if such tools are needed for other contractors.

The execution of the policies herein established should obtain sufficient fluidity and flexibility in the distribution of machine tools to make such reserves wholly unnecessary.

* * *

Recent actions of significance to the metal cutting industry were as follows:

January 27—General Preference Order E-1-b amended established a 60-day "frozen" period to apply to the schedules of machine tool producers.

Manufacturers' schedules during the freeze period are not to be upset or modified by the receipt of higher rated orders. This amendment reinstates a freeze period in the regulation, which was eliminated for a period as to orders for the aircraft program.

January 29—WPB, through Allocation Order L-159, placed plastics molding machinery under allocation control.

Order provides that no one may deliver or accept delivery of plastics molding machinery except as specifically authorized by WPB, nor may anyone manufacture or assemble such machinery except in fulfillment of orders previously

THE TOOL ENGINEER



The Abrasive No. 1 1/2 grinds accurately, gives a fine finish, and is recommended for the finest types of flat, form, and gage grinding. It is a hand feed grinder designed to handle the large number of jobs which consist of one piece only and for which no mechanic will bother to adjust automatic feeds and stops. It has an unusual capacity, handling work 15" long x 10" wide x 12" high.

Features

Built-in motor, an integral part of

head; hand feeds, eliminate many moving parts; hand wheels of good size, conveniently located; vertical adjustment rapid and sensitive; wearing surfaces easily lubricated.

The No. 1 1/2 Grinder illustrated; and the Abrasive fully automatic grinders—No. 3 B with horizontal spindle and No. 34 with vertical spindle—are described in Sweet's Catalog, or in more detail in separate bulletins available, address—

ABRASIVE MACHINE TOOL COMPANY

Dealers in Principal Cities

EAST PROVIDENCE

RHODE ISLAND

easily authorized for delivery by WPB.

January 30—Announcement made of the establishment of a Mineral Resources Coordination Division, to be headed by a Mineral Resources Operating Committee and a Minerals and Metals Advisory Committee, which are to coordinate and correlate the programs of all governmental agencies for increasing the supply of essential minerals.

January 30—Preference Rating Order P-100 amended to permit higher priority ratings for the purchase of maintenance, repair and operating supplies to producers of chemicals.

February 3—WPB issued General Limitation Order L-237 placing production and distribution of certain light power-driven tools under strict control.

Some of these tools formerly came under E-1-b. Primary purpose of the present order is to keep these tools for essential work.

February 4—Tungsten contact points released from allocation control through issuance of Order M-29 as amended. Close control of the use of tungsten will be maintained by allocation to manufacturers of the tungsten rod from which the points are made.

February 6—Report made to WPB that difficulties in obtaining certain resistance welding control parts is retarding manufacture of resistance welding machinery.

February 9—Conservation Order M-50 amended to prevent the use of scarce jewel bearings in any precision gauges except dial indicator gauges for measuring dimensions.

February 9—Effecting virtually complete control over zinc, WPB issued an addition to Conservation Order M-11, placing remelt zinc under the same controls as the six higher grades, limiting delivery of zinc by dealers to orders bearing ratings of AA-5 or higher, and regulating the transfer and use of zinc scrap.

February 9—WPB established stricter control over the use of tungsten, through amendment to Conservation Order M-29-b, which eliminates many of the exemptions contained in the order as originally issued a year ago.

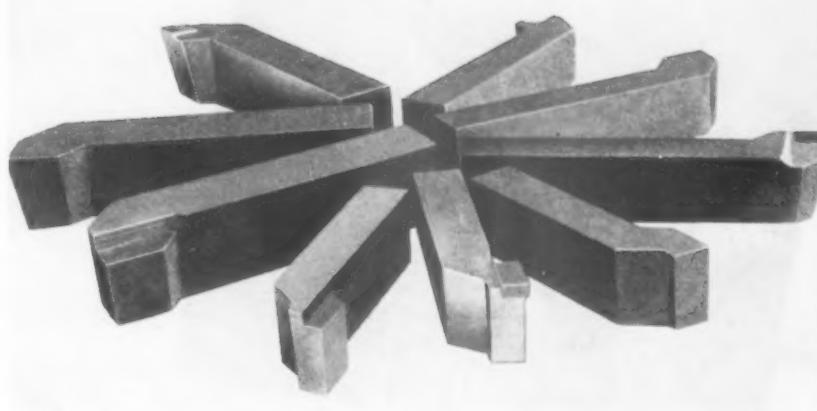
February 10—In consultation with the War and Navy Departments and the Defense Plant Corporation, WPB established a policy authorizing transfer of idle machine tools to plants which need them urgently. In cases where delivery of new machine tools cannot be obtained in sufficient time, idle tools may be transferred from one plant to meet the emergency needs of another. WPB Tools Division will handle the transfers.

February 11—Concentration of galvanized steel sheet production, to eliminate possible interference with production of steel plate and heavy hot rolled sheets, was ordered.

February 13—Increased use of scrap and chrome ore in the production of stainless steel was ordered by WPB.

February 13—General Conservation Order L-250 issued ordering specific simplification practices for controllers for electric motors. The order restricts production to orders having ratings of AA-5 or higher.

THE END



There is No Scarcity of Victory Tool Shanks

**Cast of tough Meehanite Metal,
they outperform and outlast
hard-to-get carbon steel**

For any shop equipped to tip its own cutting tools, Victory Tool Shanks offer these attractive advantages:

1. They have double the vibration damping capacity of steel.
2. Their heat dissipation is far superior to that of steel.
3. The coefficient of expansion of Meehanite is closer to carbide than is steel.
4. They require a minimum of machining before use.
5. They are available NOW.

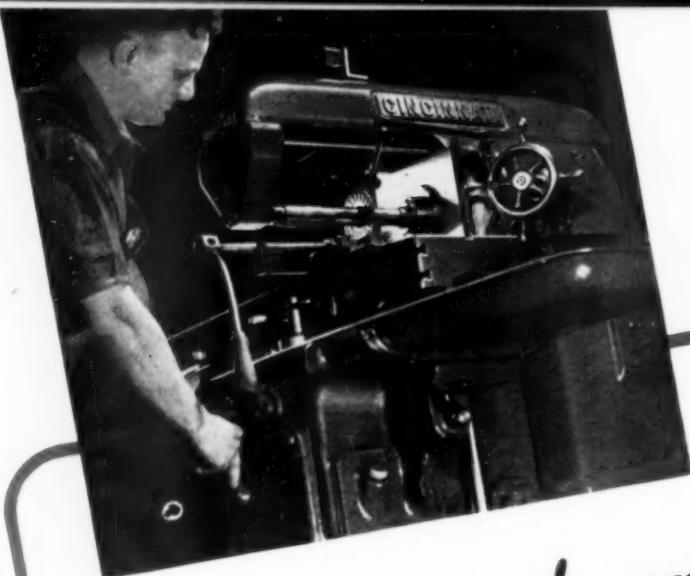
Victory Tool Shanks are stocked in many standard sizes and shapes. Special shapes can be cast to your specifications.

WRITE FOR BULLETIN NO. 52T-1 which shows sizes and prices. Pick out a size you can use and ask for free samples. Small quantities can be shipped within a few hours after receipt of order.

THE COOPER-BESSEMER CORPORATION
Sugar Street, Mount Vernon, Ohio



Cooper-Bessemer



*He can set up the job
MORE QUICKLY . . .
...and take care of
MORE MACHINES*

- Given a few weeks training, almost anyone can operate a machine, but setting-up the job requires several times as much experience. For this reason, the set-up time may often be a serious drag on production. One thing that can be done to help the situation is to install new machines which have quick and convenient set-up features, and, of course, the same or preferably greater productive capacity. One man can then take care of more machines, and there will be a smaller proportion of non-productive set-up time. Some set-up factors for a given machine—mounting the arbor in the spindle and clamping the fixture to the table—remain practically constant. Others depend upon design features. Those that vary are a matter of but a few minutes on the CINCINNATI No. 1-18 Plain Automatic Miller:

Changing feeds—pick-off gears—no wrench required.

Changing spindle speeds—pick-off-gears—no wrench required.

Adjusting spindle quill—lever clamp and handwheel—no wrench required.

Adjusting table and work to cutter—hand crank.

In the illustration, you see a typical job being milled on a CINCINNATI No. 1-18 Plain Automatic—a slot $\frac{9}{32}$ " wide, by $1\frac{1}{16}$ " deep cut from the solid at $5\frac{3}{4}$ " per minute. Because of the convenient set-up features tabulated above and the productive capacity of these machines, you know that the job will be completed in a minimum of time. Circular No. M-848, listing all of the features of the CINCINNATI No. 1-18 Plain Automatic Milling Machines, may be obtained by writing to the address given below.



● CINCINNATI No. 1-18 Plain Automatic Milling Machine



THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO

FOOL-PROOF AND MANUFACTURING FINISHING MACHINES

SUPPLY, PRODUCING MACHINES

CUTTING, SHARPENING MACHINES

Industrial News Digest....

A review of significant developments and new techniques in mass production industries.

Worker accidents reduced by trading safety data between aircraft plants

In an effort to reduce still further an already low worker accident rate, airplane plants now are exchanging accident prevention plans. A number of exchanges of safety data already have been effected under the new plan, the Aircraft War Production Council has disclosed.

Ideas: One is a "goggle cart" developed by Vega Aircraft Corporation. Equipped with new goggles, tools for their adjustment and equipment for their sterilization, the cart is circulated throughout the factory regularly.

An idea made available to other concerns by Northrop Aircraft Inc., is designed to reduce accident hazards of heavy duty machines. Operators are relieved four times each shift to avert possible injury from carelessness due to fatigue.

The Production Council, which has been exchanging technical production secrets since war was declared, is composed of the Consolidated, Douglas, Lockheed, North American, Northrop, Ryan, Vega and Vultee plants.

Steel saved by using wood trays in production control

To conserve steel and make work lighter for women employes, the Pratt & Whitney Aircraft division of United Aircraft has developed wooden containers as substitutes for steel trays generally used for parts in process.

The old trays, even without a load of knuckle pins, gears, piston pins, rods, bushings or studs, were heavy for women. The concern's production engineers designed a new type tray which is easier to lift, easier to clean and has as long a service life as the standard metal tray.

Design: The new tray has metal bound wooden sides and ends, and a plywood bottom which can be replaced when necessary by withdrawing eight rivets. Box grade 3/16-inch hardwood plywood which is not on the critical materials list and scrap metal salvaged from punch press operations are used.

The metal corner bindings are turned under the bottom for strength. Metal buttons which allow the trays to be stacked without danger of falling or slipping are on the ends of skids which extend under the four sides. Hinged metal handles and wooden or corrugated cardboard partitions to fit different parts complete the design.

Thousands of these trays are in daily use carrying small parts from raw materials or purchased parts inspection through machining and inspection departments to finished stores and assembly. Cutters and other small tools are stored in similar trays.

Other wooden containers have been designed for use by vendors in shipping parts and forgings into the aircraft plant. These are a decided improvement over loose bulk shipment, the engineers say.

MARCH, 1943

Packing exact quantities makes receiving count simple. Prong trucks handle the containers easily for transfer in the factory without the danger of nicks and scratches which occur in bulk handling.

Synthetic Rubber mountings now available; Natural rubber produced

Vibro-Insulators (rubber mountings) are now being made with Ameripol synthetic rubber, the B. F. Goodrich Company has announced.

Vibro-Insulators made of synthetic rubber are expected to find wide application in many fields of war industry where the action of oils, grease, paint, fatty acids or heat result in too-rapid deterioration of natural rubber used in mountings.

Uses: These insulators have found many uses in war plants and on war products where vibrators, shock or noise were interfering with high speed production or impairing the functioning of vital equipment.

They can be cited chiefly for performing these varied functions: Reduce wear on important, non-replaceable machinery; Aid in the manufacture and operation of precision instruments and equipment; Eliminate noise and vibration that is distracting to production and office personnel; Prevent transmission of sound or vibration from one building or one piece of apparatus to another; Increase efficiency of machine operators; Prevent eventual structural weakening or destruction of buildings.

* * *

The possible use soon of home-pro-

"GREENIE"

T.M. REG. U.S. PAT. OFF.

Going - Going - GONE!



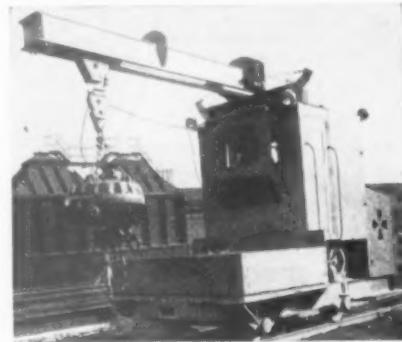
duced natural rubber in American industry recently was heightened by a Department of Agriculture report.

The first natural rubber to be produced on an industrial scale in the United States is now being processed in California, the agency announced. The source is guayule, a desert shrub. This winter's yield is expected to approximate 600 tons. Late 1944 and 1945 yield is expected to reach 33,000 tons.

Novel machine speeds industrial scrap collection

A self-powered magnetic scrap picker, constructed from odds and ends, is doing the work of six men gathering vital metal scrap.

The unit was designed and built by the Timken Roller Bearing Company for use in its railroad yards. In two hours time, it does the work three two-man crews formerly did in 24 hours.



Manpower-saving magnetic scrap picker built and used by The Timken Roller Bearing Company for use in its yards.

Design: Mounted on an ingot buggy, the scrap picker is powered by a Hercules, Ford V-8 diesel replacement engine that drives a 230 volt D. C. generator. The generator supplies power for the magnet and the electric motor drive.

The magnet is 39 inches in diameter and can lift 900 pounds of heavy scrap or 300 pounds of turnings per load. The box on the front of the picker holds about 1,200 pounds of scrap. The boom has a 12-foot swing.

U. S. produced potassium cyanide speeds silverplating

In the production of silver-plated bearings for airplane motors the rate of plating is more than trebled by the use of potassium cyanide, formerly imported from Europe but now made in this country, the E. I. du Pont de Nemours & Company states.

Tons of silver are used each week in the fabrication of bearings which will withstand high loads and terrific speeds. Air speeds would be reduced as much as 75 miles an hour if silver-plated bearings were not available, it is said. Du Pont is producing potassium cyanide from potassium salts in California.

Advantages: In an electroplating bath potassium cyanide not only increases the rate at which silver plate is deposited on the motor bearings, but gives required heavier coatings that are smooth, firmly adherent, fine grained and easily machined or burnished.

Coatings of silver deposited on the
(Continued on following page)

KANE & ROACH Use "ALLENS"

for a solid hold
on bearings

Close-up of bearing supports and adjusting screws holding roll shafts in Kane & Roach No. BBH Combination Vertical and Horizontal Straightener.



This KANE & ROACH "BBH" Combination Vertical and Horizontal Straightener does fast, versatile work in straightening squares, flats, hexagons, octagons, channels and numerous special and structural shapes. The 24 roll shafts are power-driven, and adjustable lengthwise of the stock being straightened. This allows the machine to be adjusted for the best longitudinal roll spacings for the type of section to be straightened.

Convenient adjustment of roll shaft bearings must be clinched with the solidest possible set-ups for accurate alignment. ALLEN "pressur-formd" Socket Head Cap Screws are handily and rigidly set up with hexagon keys. They HOLD the bearing supports in a grip that never works loose.

Allen is proud of its tie-in with the famous performance of Kane & Roach machines. Hollow screws are little things to these builders of steel mill equipment. But their exacting selection of little things confirms the quality of the bigger things in Kane & Roach construction.

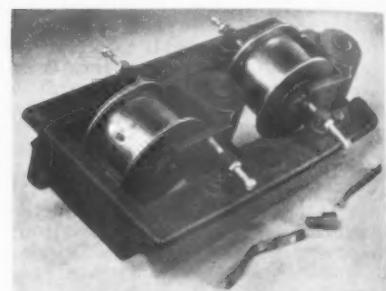
THE ALLEN MANUFACTURING COMPANY
HARTFORD, CONNECTICUT, U.S.A.

(Continued from preceding page)
bearings up to four inches in diameter, range from .00003 to .00005 in thickness, Du Pont engineers have said.

Potassium cyanide also is used in copper plating of war materials and as a nitriding agent in the surface hardening of tool steel. Before the war all of the potassium cyanide used in this country came from Germany. Half of imports threatened to hinder electroplating and surface-hardening until potassium cyanide manufacture was developed in the United States.

Pulley tightener ups belt life; Chromeplating reclaims cylinders

To keep guiding tightener pulleys on the top of drill presses in line, engineers at the East Pittsburgh plant of the Westinghouse Electric and Manufacturing Company have devised a scheme in which adjusting screws replace the flat steel springs for retaining these pulleys in position.



Drill press tightener pulleys retained in correct position by means of adjustable screws as developed in Westinghouse shop.

Operation: To use the adjusting screws, it is only necessary to drill and tap a hole through the spring retainer stud. The belt is run over the pulleys in the conventional manner and the pulleys are allowed to take whatever position they will.

The set screws are then run down tight and locked in place by means of a lock nut. The pulleys cannot shift from their position unless the screws are loosened. Belt life is lengthened considerably as a result, it is claimed.

* * *

Another application for chromeplating was found recently when Westinghouse engineers at the company's Springfield, Mass., plant developed a process of chromeplating and reboring cylinders on a war product.

Results included the reclaiming of 203 cylinders, saving 1,400 pounds of critical material and more than \$1,000 in a three-month period. The requirements of accuracy in size and smoothness of finish of the bore in these cylinders formerly resulted in a considerable scrap loss.

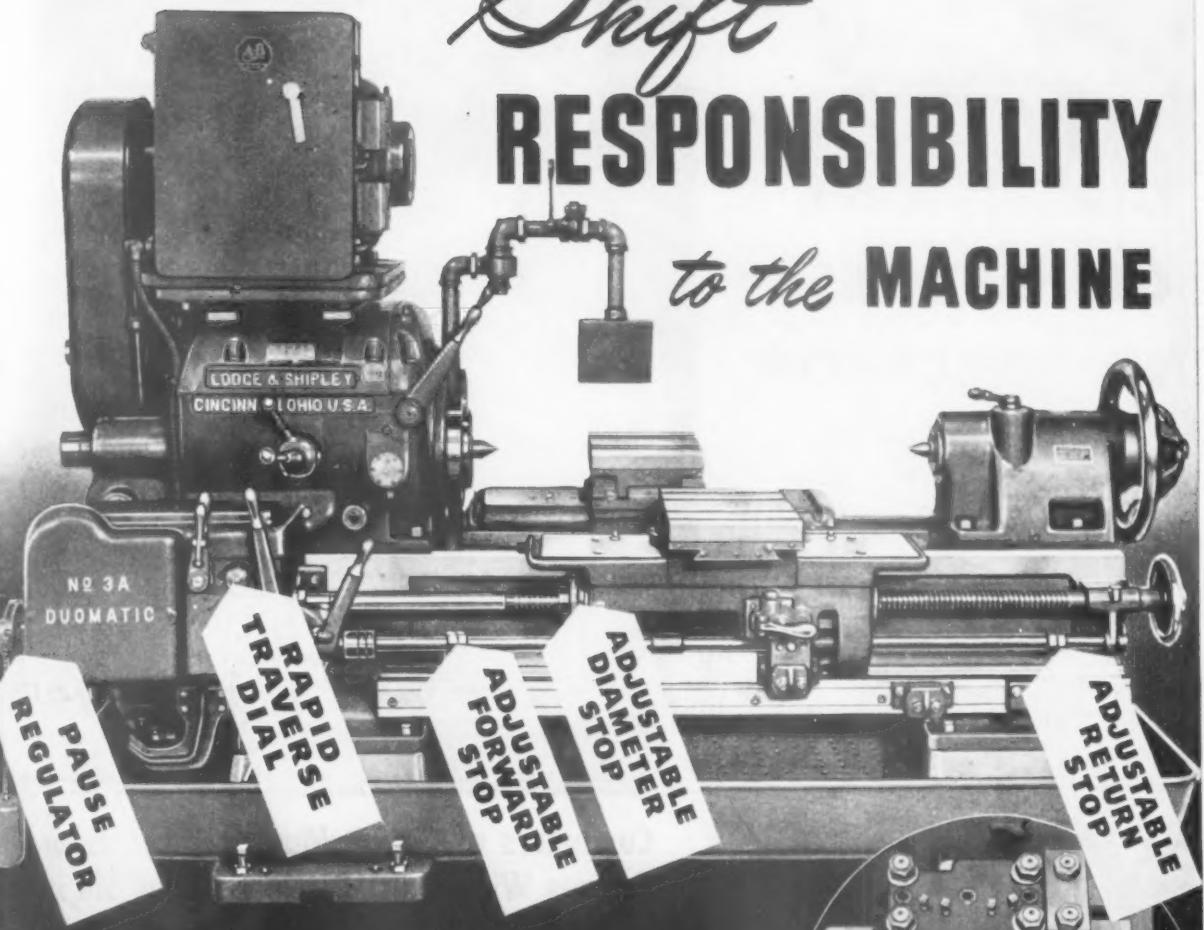
Machine tool builder stimulates worker morale with posters

An increasing number of industrial concerns, large and small, are discovering the morale-boosting effect of showing workers how their handiwork is aiding in the war effort.

One such concern with an especially progressive and well-rounded program designed to stimulate workers is the Mattison Machine Works, Rockford, Ill.

(Continued on page 120)

Shift
RESPONSIBILITY
to the MACHINE



Once established to suit the requirements of a particular job, the No. 3A Duomatic automatically controls the diameter and lengths on each successive work piece. The length of forward traverse, the length of feed, pause at end of cut and the return traverse to stop position are quickly and easily established through simple mechanical adjustments. Any combination of turning or straight or angular facing can be obtained front or rear simultaneously or independently, without the use of special or extra attachments.

Write for descriptive Booklet No. 601.

Proudly worn since
 March 6, 1942



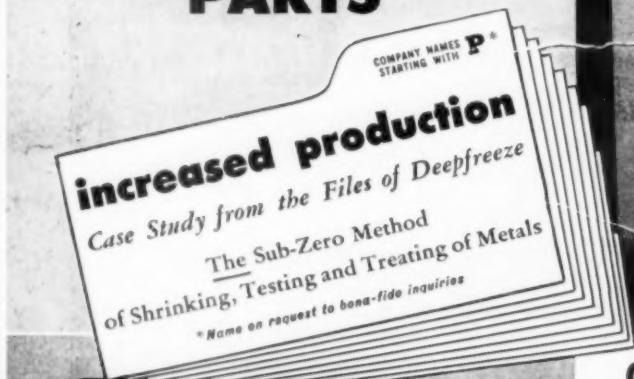
THE LODGE & SHIPLEY MACHINE TOOL CO.
 CINCINNATI, OHIO, U.S.A.

ENGINE

TOOL ROOM

AUTOMATIC LATHES

HOW TO "Freeze" DIMENSIONS ON GAUGES AND PRECISION PARTS



Typical gauges subjected to alternate cold and heat treating

DATA AND PART INFORMATION

Season gauges to prevent change in finished size.

Thread gauge treated as follows: 2 hours Deepfreeze—
2 hours boiling water—2 hours Deepfreeze.

Other gauges treated according to gauge and steel.
Some are heat treated one or more times or normalized
between machining operations. Size determines number
of Deepfreeze applications—larger gauges chilled more
than once.

Sequence of Operations on Thread Gauge:

1. Machined, heat treated and rough ground.
2. Deepfreeze and heat treat.
3. Finish by lapping.

RESULTS: Gauges hold size in transit to customer's
plant—no rejects.

SAVINGS: All time previously lost in correcting or re-
placing gauges whose size was distorted due to temper-
ature changes and jarring.

FREE ADDITIONAL DATA . . .
and proof of the outstanding
success of the Deepfreeze
method for chilling metals
are included in this book-
let. Write for your copy.



Customers of Gauge Manufacturer Now Receive Gauges With Exact Dimensions as Shipped

This prominent manufacturer of gauges experienced difficulty in preventing growth or change in size of gauges during shipment to customers, and during later use in customers' plants. Jarring and temperature changes in transit affected finished gauge size and hours of careful work were wasted. When gauges were not distorted in transit, future metal growth and warp resulted in spoiled work in the customer's plant.

Alternate Cold and Heat Treating Assures Correct Permanent Size

With the installation of Deepfreeze Industrial Chilling Equipment, together with usual heat treating, the gauges are now properly treated to hold finished size under all normal temperature changes and handling.

Gauges are stored 2 hours in Deepfreeze unit, then in boiling water, oil, or salt bath depending upon steel used, and then back to Deepfreeze storage for 2 additional hours.

The Uses of DEEPFREEZE in Your Plant

In addition to preventing growth or warp in gauges and precision parts, Deepfreeze metal chilling can help you in:

- 1—Shrinking of metals for ease of bearing assembly, etc.
- 2—Testing of metals for reaction of sub-zero temperatures to aircraft instruments, etc.

*Investigate the full possibilities and application of Deepfreeze to
your manufacturing . . . write for the booklet offered at the left.*

Deepfreeze

DIVISION

MOTOR PRODUCTS CORPORATION
2311 DAVIS ST., NORTH CHICAGO, ILLINOIS

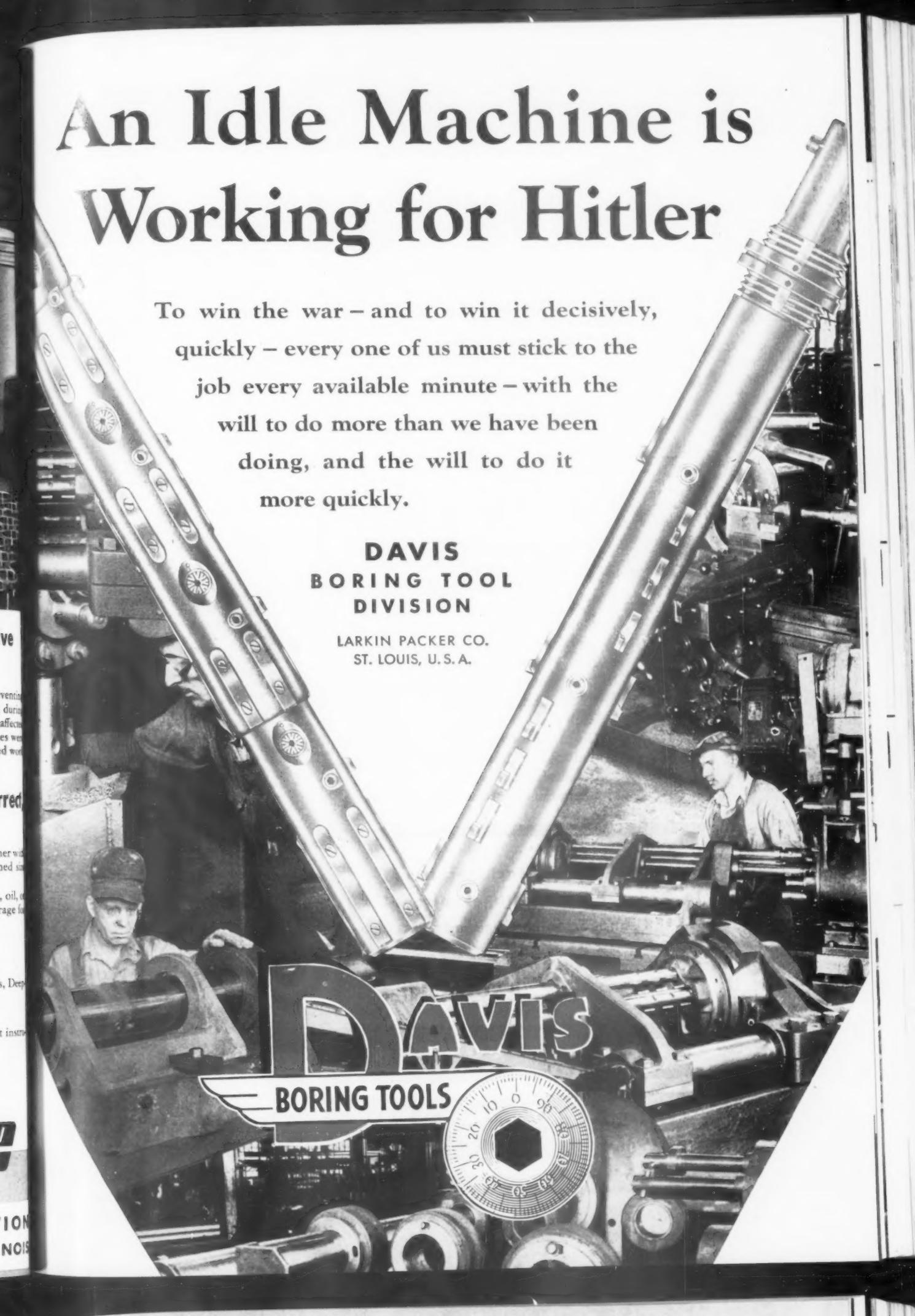
An Idle Machine is Working for Hitler

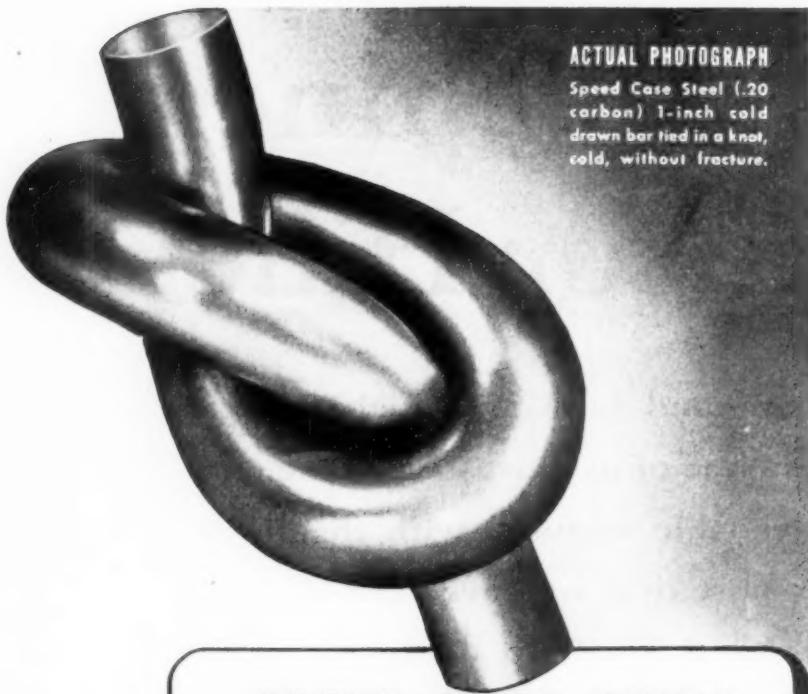
To win the war — and to win it decisively, quickly — every one of us must stick to the job every available minute — with the will to do more than we have been doing, and the will to do it more quickly.

DAVIS
BORING TOOL
DIVISION

LARKIN PACKER CO.
ST. LOUIS, U.S.A.

DAVIS
BORING TOOLS





ACTUAL PHOTOGRAPH

Speed Case Steel (.20 carbon) 1-inch cold drawn bar tied in a knot, cold, without fracture.

SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT

ONE Steel that gives you...

1. High Speed Machining
2. Greatly Increased Tool Life
3. Smooth Finished Parts
4. High Physical Properties
5. Excellent Impact Resistance
6. Good Torsional Values
7. High Case Hardness
8. Great Core Toughness
9. Reduced Carburizing Time
10. Unusual Ductility
11. Minimum Distortion

**SPEED CASE STEEL Machines from
225 to 275 S.F.P.M. with excellent
TOOL LIFE and Smoothly Finished Parts**

★ Write us for full details.... Our metallurgists are at your service.

BUY WAR BONDS

Licensee for Eastern States
THE FITZSIMONS COMPANY
YOUNGSTOWN, OHIO

Licensor
MONARCH STEEL COMPANY
HAMMOND • INDIANAPOLIS • CHICAGO
PECKOVER'S LTD., Toronto, Canadian Distributor

MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

(Continued from page 16)

Posters: Most newsworthy phase of the Mattison program is a series of posters that show employee the machines the company is building and the work those machines are doing to speed victory. The posters are placed in conspicuous spots throughout the plant and changed periodically.

The company also publishes an employee magazine in which the same theme is prominent; has an apprentice training program; holds production committee meetings and supervisory employee meetings; sponsors an employee salvage committee and an employee health program.

National Tool Salvage; Koebel Diamond Tool and Plan-O-Mill move

The National Tool Salvage Company has announced its purchase of a new plant in Detroit to house its production facilities and offices.

This company, founded in 1912, as the Peninsular Tool Salvage Company, is serving the metal working industry from coast to coast today. In the larger industrial areas it is now represented by full-time men. The work performed by the concern was described by Larry W. Lang in the December, 1942, Tool Engineer.

For the second time in two years, the Koebel Diamond Tool Company, Detroit, has moved to larger quarters as a result of expanding production.

Having more than twice the floor space, the new motor city plant will accommodate additional machines and a substantial increase in working force. As pioneers of the 'small diamond' idea, the company has developed numerous new methods of using small, plentiful stones in a wide variety of diamond dressing, boring and precision tools.

The Plan-O-Mill Corporation, formerly in Royal Oak, Mich., has moved to a new manufacturing plant and general office in Hazel Park, just outside Detroit.

Plan-O-Mill Corp., in addition to manufacturing thread and form milling machines, are now producing a line of cutters.

Standard Oil of Indiana recognizes employee service records

The Standard Oil Company of Indiana, cutting oil producers, will recognize a total of 12,160 years of service by presentation of gold pins to 668 employees during the first six months of 1943.

Six employees will receive awards for 40 years of service each, 68 employees for 30 years, 394 employees for 20 years and 200 employees for 10 years.

United Precision Products moves; Wickman changes manufacturing source

Larger manufacturing quarters in Chicago, have enabled United Precision Products Co., to step up production sharply.

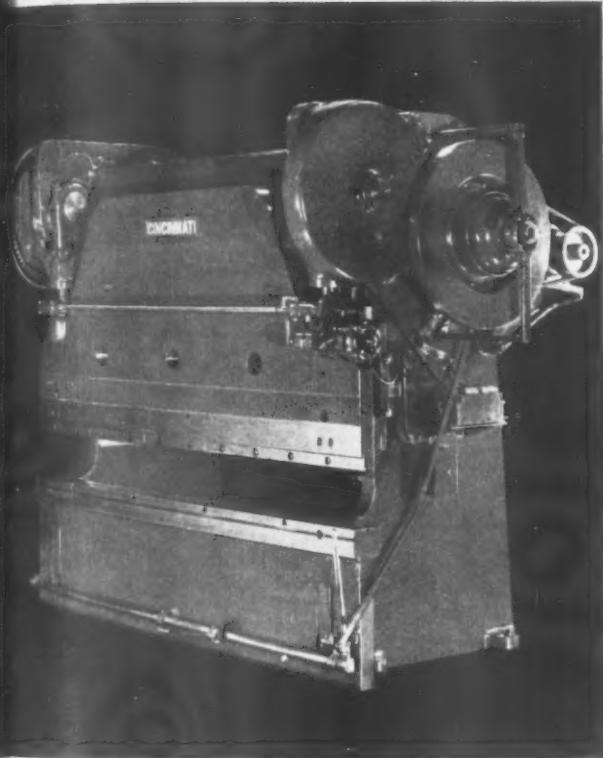
The present location of United Precision marks its third move in the last five years as a result of outgrowing manufacturing facilities. The company produces reversible "Go" and "No Go" precision gages, in sizes from .030 to 1-1/2".

(Continued on page 122)

THE TOOL ENGINEER



OFFICIAL PHOTO, U. S. ARMY AIR CORPS



A complete picture of the many uses of Cincinnati
Press Brakes is covered in Catalog B-1.
Write for your copy.



Runways for the "War Birds" are laid like a carpet—landing fields are built like magic—Cincinnati Press Brakes are at work on both planes and landing mats.

Their adaptability and accuracy may solve a production problem for you.

THE CINCINNATI SHAPER CO.
CINCINNATI OHIO U.S.A.
SHAPERS · SHEARS · BRAKES

(Continued from page 120)
inch; also a complete line of gages of American Gage Design.

Upon completion of orders received up to March 14, the joint operational agreement between the Sheffield Corp., Dayton, Ohio, and the Wickman Corp., is being dissolved by mutual consent.

Lukens Steel Company division steps up war products output

By-Products Steel Corp., a division of the Lukens Steel Co., produced 53 percent more war materials in 1942 than the record previous year, the concern announced.

A producer of vital flame-cut parts

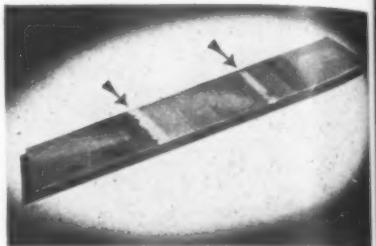
for Army tanks, the company increased production of parts per man per eight-hour shift more than 25 percent during the past year. As one of the largest producers of parts for a Navy anti-aircraft gun, By-Products now produces ten times the gun parts it did at the start of the defense program.

Methods: The company manufactures a variety of steel plate products by shearing, blanking, pressing and flame-cutting. An exponent of the flame-cutting process, during the past year it completed a new plant entirely devoted to production by this method. One of the company's developments is a machine that enables one man to operate ten of the flame-cutting torches at one time.

By-Products also makes bearing shells for turbines and ship drive gears, turbine blades and rings, ship bulkheads, mooring bits, and chocks, and deck and boom fittings.

Continental Motors uses cutting tools made from scrap steel

A large user of critical high-speed steel in cutting cooling-fins for aircraft engines, Continental Motors Corp., is now effecting considerable savings by utilizing scrap high-speed steel sections joined to a mild steel body.



Cutting tool used by Continental Motors for colling fins for aircraft engines. Scrap high-speed steel is joined to mild steel body by use of welding alloy.

MOTO-TOOLS SPEED UP WAR PRODUCTION



Above: Moto-Tool is ideal for getting into close quarters, grinding, buffing and finishing to required specifications. Can be used for metal, wood, plastics, porcelain, glass, and other materials.

27,000 RPM

The complete Moto-Tool kit has accessories for all types of grinding, buffing and finishing operations . . . with steel cutting tools and the best abrasives. Consists of 1 Model 2 Moto-Tool with 3 collets: $\frac{1}{8}$ ", $\frac{3}{32}$ ", and $\frac{1}{16}$ ", 4 Emery Wheel Points, 1 Dressing Stone, 8 Carving Cutters, 1 Steel Saw, 3 Bristle Brushes, 1 Steel Cleaning Brush, 1 Screw Mandrel with Sanding Discs, and 1 Shoulder Mandrel, one $\frac{1}{8}$ " Drum Sander. Packed complete in sturdy felt-lined hardwood cabinet case \$23.50. Dremel No. 2 Moto-Tool only \$16.50.



Below: Tool makers find Moto-Tool's sensitive, finger-tip control indispensable when shaping intricate or irregular metal dies. For grinding or cutting with steel accessories . . . it can't be beat for convenience and adaptability.



10 DAY TRIAL

Try a Dremel Moto-Tool for 10 days in your own shop. See how versatile, how indispensable it can become to fast, accurate work. Order from your industrial distributor, or contact any of the following representatives:

WEST COAST
THE FEDERATED SALES
CO.
2437 West Valley Blvd.
Alhambra, Calif.

METROPOLITAN NEW YORK
MILL FACTOR PRODUCTS CO.
53 West Broadway
New York, N. Y.

NEW ENGLAND
F. W. FOWLER
116 Dartmouth St.
West Newton, Mass.



Dremel emery wheel points, steel cutters and accessories with $\frac{1}{8}$ " shanks are available for quick delivery in a wide variety of sizes and shapes. They can be used with practically all makes of hand grinding tools. Write for catalog.



DREMEL MANUFACTURING CO., T443-C, RACINE, WIS.

The company fabricates this unusual tool by chamfering joints in X shape and joining pieces with Castolin Eutectic Low Temperature Welding Alloy. **Method:** Numerous brazing materials were tried on this job but none gave the strength necessary in such a cutting tool. The desired strength eventually was found in Castolin Eutectic.

This low temperature alloy provided a joint at 1,300 degrees F with only localized heating, thus preventing annealing of the heat treated high-speed steel which retains all its original hardness. The cutting edges are not affected and the process provides strength comparable to and in many instances higher than in fusion welding since the low temperatures used do not change structure of the parent material, it is said.

Alloys cut need for tin in bearings; New backing for lead-base bearings

Thousands of tons of war-scarce tin can be saved annually through the use of substitute alloys in bearings, experiments at the Battelle Memorial Institute, Columbus, Ohio, indicate. Use of tin for 1943 has been restricted by the WPB to 12,000 tons.

Substitutes: "There are several alloys which possibly can be used as substitute for the standard 80:10:10 bearing bronze without sacrifice of bearing quality," the report states. These would reduce refined tin requirements for this purpose approximately 70 percent.

The 80:10:10 alloy, metallurgists explained, is bearing bronze composed of 80 percent copper, 10 percent lead and 10 percent tin. Most bearing bronze is used for bushings in which a shaft runs directly on the bronze, they said.

The Battelle experiments have demonstrated that satisfactory bearing alloys can be made with a 2.8 percent tin content, and for some purposes, with no tin at all.

"The substitute alloys have tensile and hardness properties different from the

(Concluded on page 124)

SPEED THE JOB »AND SAVE THE SAW

bearing
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bulk-
cks, and

high-speed
aircraft
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body by

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DROP FORGED SHELL

A Birmingham, Ala. firm. Our recommendation: Use an A temper, 8 pitch, .057 Raker set. Speed 75 to 85 cut 1.09 square inches per minute.

STEEL SPANNER WRENCHES

Sent by a Toledo, Ohio, firm. Recommended an A temper, 14 pitch, $\frac{1}{4}$ " saw, .042 Raker set, run at 200 f.p.m. to cut 1 piece in 21.7 minutes.

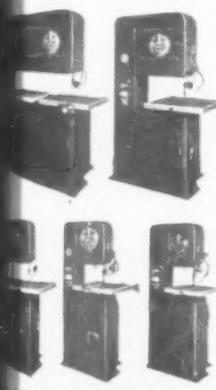
14 ST DURALUMIN

Sent by an Airplane manufacturer. Recommended an A temper, 6 pitch, $\frac{1}{2}$ ", saw .042 Raker set, run at 400 f.p.m. to average 7.59 square inches per minute.

Quality Tools Made by Associate Companies

THE BIG 5

DoAll Contour Machines for rapid internal or external sawing and filing. Priced from \$1,000 to \$5,000, each model with motor.



ALL GAGE BLOCKS

Each set, Made to accuracies:
Set, 8 millionths of an inch, \$295.00.
Set, 4 millionths of an inch, \$350.00.
Set, 2 millionths of an inch. Price application.



DOALL GRINDER

Finest surface grinder made for high precision accuracy as to size, flatness and parallelism. Adaptable to wet or dry grinding.



The new DoAll Saw Clinic will show you how. Here is a modern clearing house for tough sawing jobs. On the staff are engineers and metallurgists who do nothing but research work to determine the most efficient saw speed, feeding pressure, etc. to use on every kind of material. The service costs you absolutely nothing. Just send in your actual jobs.

*Jobs you want to cut faster

*Jobs requiring a smoother finish

*Jobs that now cause saw breakage

*Jobs of hard-to-saw metals or alloys

They will be put through a series of tests and a written report of results and recommendations sent you.

DOALL BAND SAWS

Pat. No. 2,255,577
Des. No. 127,313
Other Pats.
Pending



The modern, efficient little metal cutters with extra hardened teeth. Made in a range of sizes and styles to cut every metal, alloy, plymetal, magnesium, synthane, etc. 100 feet of saw in each Strip-out box.

FREE SAW BOOK

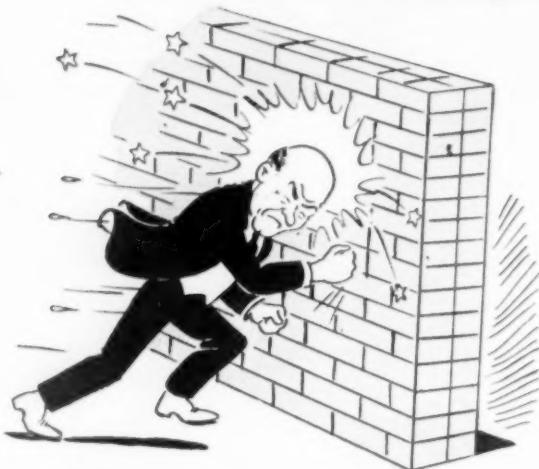
Contains case histories of difficult sawing jobs. Write for copy today.

THE DOALL COMPANY

1211 Thacker St., Des Plaines, Ill.

Local DoAll offices (See your phone book) distribute DoAll Band Saws and Files. They also sell and service machines and tools shown at the left.

When you're up against it



...for Tool and Die repairs

TURN TO

Welding Equipment & Supply Company for the solution:

There you will find "SUTTONIZING", a welding process for the reclamation of high speed steel cutting tools and the complete line of Eureka tool steel electrodes for repairing and compositely constructing oil, water, air and hot working tool steel dies of all descriptions.

WELDING EQUIPMENT & SUPPLY CO.
222 Leib Street • Detroit, Michigan



Gentlemen: Please send us complete information about "Suttonizing."

Name _____

Address _____

City _____

State _____

Why don't you be Upp and Adam too and conserve tool steel for Uncle Sam — mail this coupon to us right now!

WELDING EQUIPMENT & SUPPLY COMPANY
22 Leib Street
Detroit, Michigan

(Continued from page 1)

standard, but performance tests do not indicate difficulties because of these differences," the report stated.

Savings of more than 99 percent in the tin content of bearing babbitt, and the possibility of eliminating costly anchoring methods are two developments resulting from extensive experiments made by The Cooper-Bessemer Corporation.

According to research and development engineers of this engine manufacturer, a comparatively new metal cleaning method known as the "Kulene" process was credited largely for their success in being able to use and satisfactorily anchor lead-base bearing babbitt. They suggest that their development will be suitable for all bearings with the exception of those subjected to the most severe stresses.

Method: Using an engine-driven compressor as an example, the concern has revealed how the huge engine's bearing shells and crosshead shoes are cleansed of surface impurities by means of immersion in salt bath solutions.

The bearing shells are first dipped into a hot molten salt bath to remove the carbon (graphite) particles common in cast iron. By cleaning out these particles in the metal, a considerable amount of anchoring surface is added for bonding the babbitt.

After rinsing, the backings are placed in another salt bath to reduce surface oxidation resulting from the first bath.

The backings are again rinsed and suspended for a few seconds in cold hydrochloric acid before they are dipped in a flux and placed in a low tin-content alloy which forms a uniform coating on the bearing surface.

The bearing backings, so coated, are placed in jigs, and babbitt is poured against them.

"The bonding is so uniform and firm," said Cooper-Bessemer Metallurgist T. E. Eagan, "that we have been able to reduce the bearing thickness to a small fraction of the thickness formerly required."

Auto Engineering: Industry meets aircraft engine demands

America's industrial giant, the auto industry, is now turning out precise, intricate materiel for the armed forces at a rate fast approaching \$20,000 a minute—\$1,000,000 an hour!

At year's end, automotive companies were producing aircraft items at an annual rate of \$2,500,000,000. And, converted to and measured by any monetary standard, that is an unbelievable quantity of materiel. The rate of output still is climbing.

Engines: Much of this total is accounted for by the industry's aircraft engine production. Not only in Detroit, but in branch plants scattered across the nation more than a half dozen major auto concerns have erected new plants or converted old ones to the manufacture of Pratt & Whitney, Wright Aeronautical and Rolls Royce engines.

Builders of the world's finest automobile engines, American automen received a jolt when they first studied the specifications for aircraft power plants. Neither their engineering personnel or workers were experienced at

(Continued on page 126)

THE TOOL ENGINEER

Over 300 CARBOLOY STANDARDS*

(TRADE MARK) ★ CEMENTED CARBIDE

FOR WAR PRODUCTION

*Standard Stock TOOLS AND BLANKS

Standard stock items are tools and blanks manufactured in mass production, therefore lower priced and more readily available than tools or blanks made to order. Standard tools shown below, in center, can be quickly adapted to meet rush needs by grinding them to special shapes in your tool room.



Precision
Boring
Tools

Two types: (1) carbide tipped (with flat top or back rake) sizes $\frac{5}{16}$ " through $\frac{1}{2}$ " diameter. (2) solid carbide $\frac{3}{16}$ " through $\frac{1}{4}$ " diameter.

Lathe and Grinder Centers

(Up to 50 times longer life than steel. Available as carbide tips only or finished tipped centers. (Morse, B & S, or Jarno tapers.)



Standard Carboloy Blanks

For emergency tooling, braze Carboloy blanks to your own shanks. Large selection available.



Style 100



Sizes $\frac{1}{16}$ " to $\frac{1}{2}$ " thick



Pointed Nose
Blanks



Reamer
Blanks

Scraper
Blanks

Ammunition Dies



Complete line of standards for drawing .30 and .50 cal. cartridge cases, and 20 mm through 105 mm steel shell. Full line of brass shell dies.

General Purpose Standards for Steel, Cast Iron, Etc.

(You quickly grind to hundreds of special shapes. Wide range of sizes)



Style 4
(Style 7, left hand)



Style 13
(Style 14, left hand)



Style 5
(Style 9, left hand)



Style 10
(Style 11, left hand)



Style 12



Style 1

6 Films Available for Your Plant Training Program

Films show detailed step-by-step procedure on manufacture, design, application and grinding of carbide tools. 35 mm silent slide films (not motion pictures) available at approximate cost of \$20 per set of six.



Masonry Drills

Drills concrete, brick, etc., 75% faster than old methods. Use in portable electric drills or hand braces. Speeds up installation of wiring, piping, machinery, etc. Sizes $\frac{1}{16}$ " to $1\frac{1}{2}$ ".

Diamond-Impregnated Wheel Dressers

Contains large number of sharp diamond particles permanently embedded in carbide matrix. Eliminates remountings. Saves 25% in annual dresser costs. 3 sizes. For all grinding wheels.



*Standard-Design Tools

Standard-design tools are former "specials" for which there has been a large demand within a narrow range of minor design variation. Standardization now broadly meets most previous requirements. You order by tool number; eliminate time for drafting, blueprints, quotations, etc.



For Roller Turners
On Gisholts and W. S. Lathes

Cut-off Tools

For cutting off to hollow cores such as shells.



Grooving Tools

Widths over .060" through .330"



Shear Type Tools

Primarily for interrupted cuts on large forgings or castings.



Send for Catalog

32 page catalog No. GT-142 shows full line of standard-stock and standard-design Carboloy Tools. On request.



CARBOLOY COMPANY, INC.

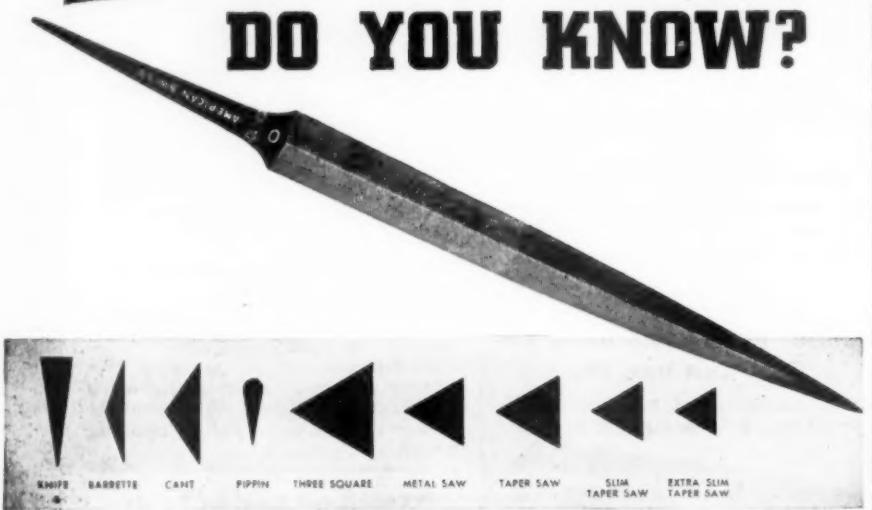
Sale makers of the Carboloy brand of cemented carbides.
11145 E. 8 MILE ROAD, DETROIT, MICH.
Birmingham, Ala., Chicago, Cleveland, Los Angeles,
Newark, Philadelphia, Pittsburgh, Seattle, Canadian
Distributor, Canadian General Electric Company, Ltd.,
Toronto, Canada.

CARBOLOY CEMENTED CARBIDES

TRADEMARK

TOOLS • DIES • DRESSERS • CORE BITS • MASONRY DRILLS • WEAR RESISTANT PARTS

HOW MANY *Triangular Files* DO YOU KNOW?



The "American Swiss" line of Swiss-Pattern Files includes nine different shapes of triangular files . . . each designed for specific kinds of precision filing work. For example, the long narrow wedge shape of the Knife File is for filing acute angles, and the delicate proportions of the Metal Saw File enable that type to work in particularly small holes and spaces.

For 40 years these files, like all "American Swiss" products, have been popular with file users because of their uniform hardness, clean sharp teeth, and long wearing qualities that assure better work in less time and at less cost. Today, these "American Swiss" File qualities are helping ordnance plants and machinery builders all over the country do their share in the National war effort.

MORE THAN 3000 SHAPES, CUTS AND SIZES

Cuts Nos. 00, 0, 1, 2, 3, 4 and 6

Hand	Pipine	Half Round (Coarse Cut)
Pillar (Regular)	Crochet	Flat (Coarse Cut)
Pillar (Narrow)	Round	Mill
Pillar (Extra Narrow)	Square	Mill (2 Round Edges)
Half Round	Three Square	Finishing
Slim Half Round	Metal Saw	Round Edge Joint
Half Round Ring	Slitting	Square Edge Joint
Crossing	Checkering	Die Sinkers
Knife	Parallel Round	Needle
Warding	Coll or Point	Escapement
Equaling	Taper Saw	Machining
Barrette	Slim Taper Saw	Die Sinkers' Riflers
Cant		Silversmiths' Riflers



FREE CATALOG
SENT ON REQUEST

American Swiss File & Tool Co., Elizabeth, N. J.

Look for
this trademark.



Buy from
our distributor.

AMERICAN SWISS SWISS-PATTERN FILES

(Continued from page 124)
maintaining the tolerances demanded in American-type radial engines or British-type Rolls Royce liquid cooled. Yet 12 months after war was declared, Chevrolet, Buick, Ford, Studebaker, Nash and Packard were shipping these complicated units from conveyor lines.

Chevrolet: Radial engines are the chief war product of this Number One volume auto maker. Almost a dozen of its big plants throughout the country have been converted to Pratt & Whitney parts manufacture.

Contracts now signed will increase five-fold Chevrolet's current rate of production, the company has just announced. This concern got into the aircraft engine program after others—including its corporate partner, Buick—had gobbled up most of the vendors. It has had to turn out almost every necessary part in its own plants.

Ford: First to undertake radial engine building, Ford has been turning out the 2,000 horsepower Pratt & Whitney engine for more than two years in a spectacular \$45,000,000 factory at Dearborn.



Natco multiple spindle drill in Ford engine plant performing work on nose piece that once required two machines.

Plans for doubling Ford output were announced a few days ago. The government's agreement to farm out work, prove that the expanded output would not disrupt Willow Run work or disturb the local labor market. Other Ford war projects may be cut back. Highland Park, Lincoln and a score of the concern's Village Industries will be drawn into the program.

The Rouge plant engine building factory now has only one assembly line. Every department on its first floor is now being moved to other Rouge plant buildings, and the entire area will be devoted to final assembly.

Nash: Awarded contracts for 2,000 horsepower Pratt & Whitney engines long after others started, this independent producer has completed the conversion of its big Kenosha, Wis., assembly plant and started production about the first of this year.

Faced with smaller facilities and fewer parts suppliers than the bigger concerns, Nash has had to rely on "conversion" and new tooling for much of the job. What was once a "chain" of building sections, now appear as one huge plant, with a main corridor down the center for nearly half a mile. A new structure for assembly, testing and shipping was built.

(Army-Navy "E" Awards", page 128)

THE TOOL ENGINEER

Jarvis POWER TOOLS

TOOL ECONOMY IS THE WATCHWORD

Salvaging tools by sending them back to the manufacturer for regrinding saves labor and materials -- and thus saves tools. We are at your service.



THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES

*W-S Standard Reamers with carbide tips.
Tapered shank (illustrated) and straight shank types.
Sizes: $\frac{1}{4}$ to $1\frac{1}{2}$.*



STANDARD CUTTERS *available from stock*

REAMERS and many other cutting tools formerly in the "special" class are now STANDARD with us. The majority of these STANDARD cutters is in stock most of the time. Our broad line often enables the consolidation of tool orders and saving of valuable time. Each W-S tool is genuine CARBOLOY tipped. The grade used is the one best suited to do a cutting job on the metals for which the tool was ordered. (Other brands of carbide can be specified.)

Carbide tipped tools are not just a specialty with us . . . we make them exclusively. You can expect and get uniform, high quality results with W-S tools. Write for new FREE Catalog 942 and latest prices. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

SAVE TIME... wire or phone your requirements!

*W-S Carbide Tipped Core Drills available in straight and tapered shanks.
Sizes: $\frac{1}{8}$ to $1\frac{1}{2}$.*



W-S Carbide Tipped Centers available in Morse, Browne & Sharpe and Jarno Tapers.

WENDT **sonis**
CARBOLOY CUTTING TOOLS

CENTERS • DRILLS • CORE DRILLS • COUNTERBORES • SPOT FACERS
END MILLS • REAMERS • HOLLOW MILLS • LATHE BITS • SPECIAL TOOLS



ARMY - NAVY
"E" AWARD WINNERS

THE AIRCRAFT ACCESSORIES CORP.
Burbank, California
AIRESEARCH MANUFACTURING CO.
Los Angeles, California
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The Stanley Works
Bridgeport, Connecticut
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Oakland, California
THE F. H. BICKFORD CO.
Dayton, Ohio
BORG-WARNER CORP.
Long Manufacturing Division
Detroit, Michigan
Pump Engineering Service Corp., Division
Cleveland, Ohio
THE BRECON LOADING COMPANY
Coosa River Ordnance Plant
Talladega, Alabama
CATERPILLAR TRACTOR CO.
East Peoria, Illinois
CITIES SERVICE DEFENSE CORP.
Little Rock, Arkansas
CLARK EQUIPMENT CO.
Clark Trucktractor Division
Battle Creek, Michigan
COLUMBIA STEEL & SHAFTING CO.
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COLUMBIAN STEEL TANK CO.
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CORNING GLASS WORKS
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CLEVELAND AUTOMATIC MACHINE CO.
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THE DE VILBISS CO.
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ECLIPSE COUNTERBORE CO.
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FAICHNEY INSTRUMENT CORPORATION
Watertown, New York
FARNSWORTH TELEVISION & RADIO CORP.
Marion, Indiana
FISHER BODY DIVISION
Plant No. 1 General Motors Corp.
Flint, Michigan
FISHER TANK ARSENAL
General Motors Corp.
Grand Blanc, Michigan
GENERAL MOTORS CORP.
Inland Manufacturing Division
Dayton, Ohio
Moraine Products Division
Dayton, Ohio
GLAMORGAN PIPE & FOUNDRY CO.
Lynchburg, Virginia
HANDY & HARMAN
Bridgeport, Conn.
ILG ELECTRIC VENTILATING CO.
Chicago, Illinois
ILLINOIS GEAR AND MACHINE CO.
Chicago, Illinois
INTERNATIONAL HARVESTER CO.
West Pullman Works,
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LIMA LOCOMOTIVE WORKS
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THE LUCAS MACHINE TOOL CO.
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Philadelphia, Pennsylvania
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Cleveland, Ohio
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PACKARD MANUFACTURING CORP.
Indianapolis, Indiana
PITTSBURGH STEEL CO.
Aliquippa, Pennsylvania
Monessen, Pennsylvania
REX MANUFACTURING CO., INC.
Connersville, Indiana
THE STANLEY WORKS
New Britain, Connecticut
TEXAS WASHER CO.
Houston, Texas
THIBODAUX BOILER WORKS, INC.
Thibodaux, Louisiana
TRAILER COMPANY OF AMERICA
Cincinnati, Ohio
UNITED STATES MACHINE CORP.
Lebanon, Indiana
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WEBBER GAGE CO.
Cleveland, Ohio
WESTERN STOVE COMPANY, INC.
San Bernadino, California
WILLYS-OVERLAND MOTORS
Toledo, Ohio

THE TOOL ENGINEER

What's the hottest spot in a Dog Fight?

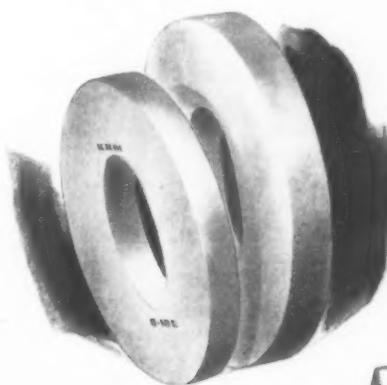


A pilot may keep cool in a "dog fight"—but not his engine! And to function smoothly at high engine temperatures all moving parts must be ground and finished with split hair precision. And that's where Carborundum comes in. For instance, the valve stems are ground to the required accuracy by a centerless grinding process which Carborundum helped develop.

The centerless grinder grinds the valve stems to an accuracy of five ten-thousandths of an inch. Does it, too, in half the time other finishing methods would require. Carborundum has led in the development of centerless grinding wheels to speed the output of valves, pistons, shafts and other such parts that go into a plane.



Because of the vital part grinding plays in war production, correct care and use of grinding equipment is a wartime must. Every grinding wheel is a "Weapon for Production" and should be properly used for maximum effectiveness. The Carborundum Company, Niagara Falls, New York.



Carborundum is a registered trade mark of and indicates manufacture by The Carborundum Company.

DIVING SPEEDS require Extra Safety



... as with

MICROHONING

When diving motors "rev" up to 5600 r.p.m., the entire success of a mission may depend upon having an extra margin of safety in critical bearing surfaces. These surfaces are not completely safe unless extremely accurate, and "structurally perfect"—entirely free of microscopic cracks and disturbed subsurface material which induce fatigue failure.

MICROFINISH HONING is providing such surface quality in regular high production because—

It does not generate injurious frictional heat—hence avoids cracks.

It does not disturb or weaken subsurface material.

It corrects error and generates accuracy.

It generates any desired type or degree of controlled surface finish smoothness.

It provides all these advantages under the control of a single process.

Write for Bulletin A. R. 67

Micromatic
HONE CORPORATION
DETROIT, MICHIGAN
Manufacturers of Honing Machine Tools



MICROHONING is used to finish

Gun Barrels—before and after rifling—diameters .303" to 18" and lengths up to 75 feet • **Gun Recuperators and Engine Cylinders** • **Wrist Pins** • **Valve Guides** • **Con Rods** • **Bearings** • **Pneumatic and Hydraulic Cylinders**—and many other precision parts for ordnance, aircraft, automotive equipment, tanks, machine tools, etc.





Cylinder head manufacture at Lycoming Division, Aviation Corp. Head has been heated to 650 degrees F. In 76 seconds before the

head cools 15 degrees, three-man teams perform more than 12 operations including installation of forged cylinder barrels.

PRODUCTION PIX

WHAT'S DOING IN THE WORLD OF MASS MANUFACTURING



Mrs. Marie De Temple proves women equal men at machine tool operations in the Machine Division of The Osborn Manufacturing Co.



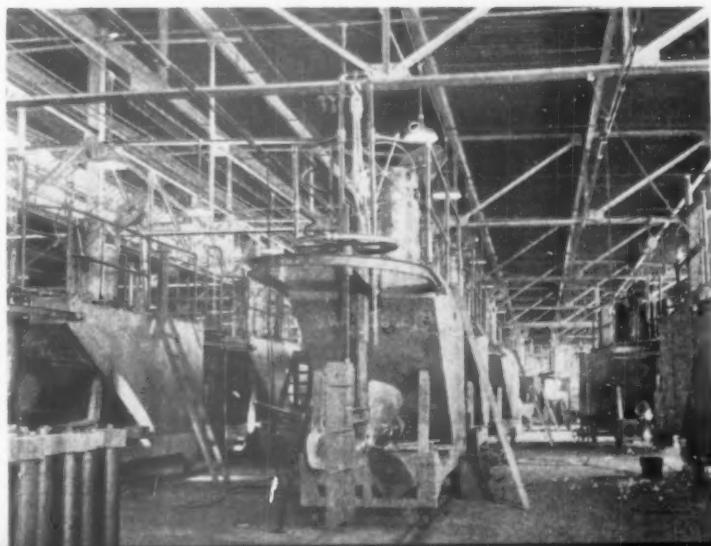
The Primary selection phase of a new aircraft rivet sorting machine developed by GM's Fisher Body Division. Aluminum rivets are retrieved, placed in revolving cylinders. Holes vary in size so that rivets are sorted according to thickness.



The New England Carbide Tool Co. claims the distinction of employing the first woman in tungsten carbide work—early in 1941.



Left — Forged aluminum propeller blades being loaded into heat-treat in an Aluminum Co. of America plant. The average bomber contains 30,000 pounds of this metal.



Right — Assembly line in Chrysler Corp. plant with marine tractors under construction. They can be attached to any flat-bottom cargo carrier. Power is an 8-cylinder engine.

Tools FOR VICTORY!



* * * * *



Scrapped cutters, drills, reamers, end mills, files, high speed tools of all descriptions, **should be salvaged**, reconditioned and put back into active service. **We can do it.**

Despite record production, tool suppliers cannot meet all demands. We know how to recondition your worn tools so that they will be the equal of new tools—and with real profit for you. Our experience in reconditioning extends over a 30-year period.

* * * * *

A COMPLETE RECONDITIONING SERVICE FOR TOOLS



EASTERN CUTTER SALVAGE CORPORATION, 30-32 LITTLETON AVE., NEWARK, N. J.

Chrome Plant • MASTER CHROME SERVICE, INC., 5709 HERMAN AVE., N. W., CLEVELAND, OHIO





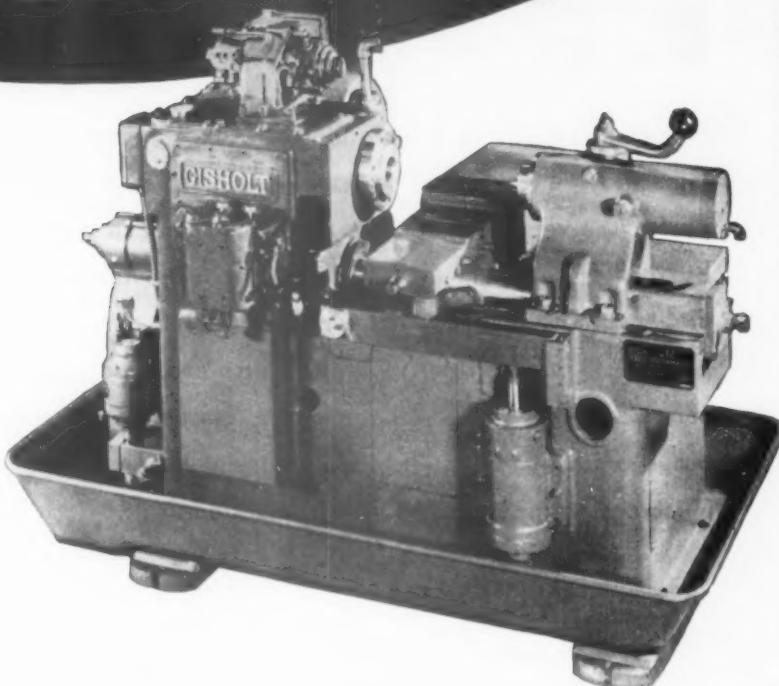
HOW LONG TO LEARN THIS?

WITH this one simple control, the operator of a Gisholt Hydraulic Automatic Lathe performs an entire cycle of machining operations. The machine does all the rest—swiftly, accurately—and completely that one operator can tend two or three machines.

The fact that very little training is required makes the Gisholt Hydraulic Automatic Lathe an especially valuable wartime tool wherever parts are machined in large volumes.

GISHOLT MACHINE COMPANY

E. Washington Avenue • Madison, Wisconsin



THE GISHOLT HYDRAULIC AUTOMATIC LATHE

—rigidly built for multiple cutting with accuracy at high cutting speeds, handles a wide variety of chucking and between-centers work. Literature on request.

AHEAD . . . KEEP AHEAD . . . WITH

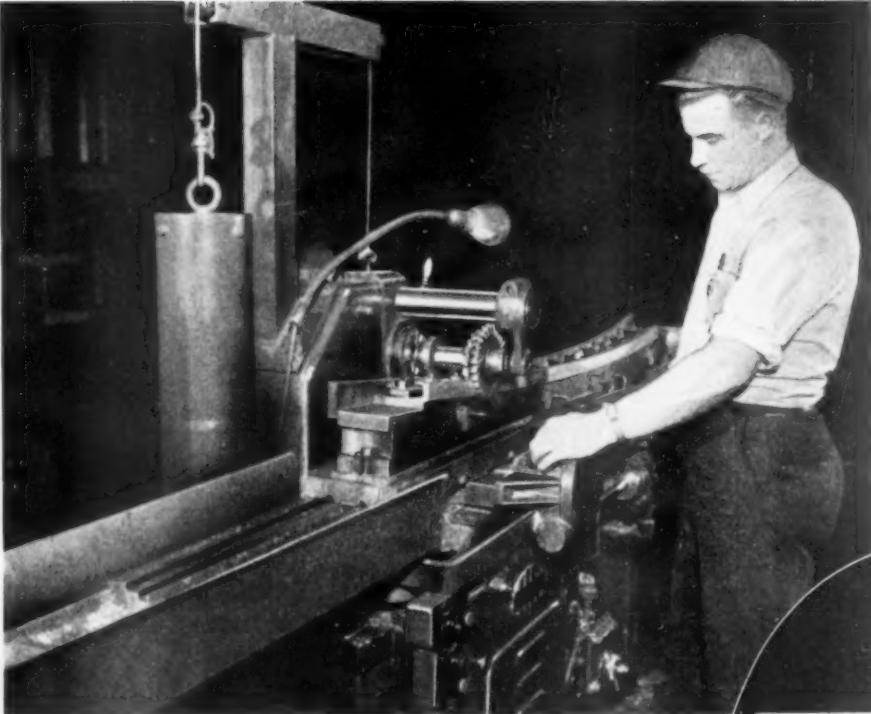
IMPROVEMENTS IN METAL TURNING



The Army-Navy "E"
and the Treasury
Flag fly side by side
at Gisholt.



TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES



WE'RE

Proud

TO CONTRIBUTE TO
HISTORY'S GREATEST
MASS PRODUCTION
OF MILITARY AIR-
CRAFT

U. S. Multi-Miller

In peace time, the U. S. Multi-Millers are used for performing a wide variety of milling operations on small precision parts. The versatility of these machines has been proven by their wide use in the War program. Operations on airplane motor parts, components for small arms, fuse parts for bombs, surgical instruments, etc., are being handled rapidly and economically. Naturally we are proud of the part the U. S. Multi-Millers are performing in increasing the speed of War production.

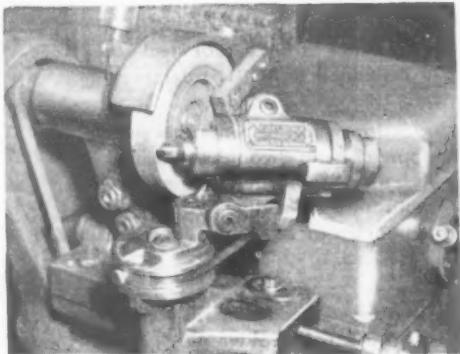
In the photograph above, a special application of a U. S. Multi-Miller is pictured in operation at one of the world's largest aircraft plants. This special application for milling splice plates emphasizes the versatility of the U. S. Multi-Millers. The cutter arbor is raised and lowered automatically as the table action feeds the work longitudinally.



U. S. TOOL COMPANY, INC.
AMPERE (EAST ORANGE), NEW JERSEY

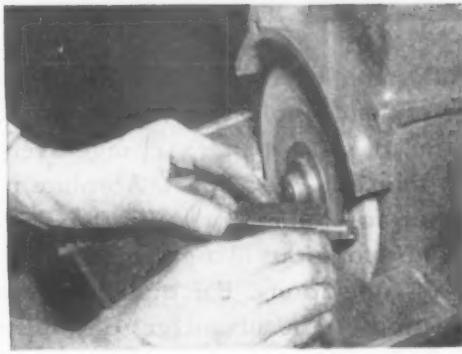
TO GET MAXIMUM TOOL LIFE PLUS PRODUCTION — ACCURACY — FINISH FROM YOUR BORE-MATIC TOOLS

**GRIND TOOLS
THIS WAY**



Your single point carbide tools can be quickly lapped exactly to required specifications on the Heald Tool Sharpener — make a few simple adjustments, flick a switch and your tool is correctly lapped, automatically.

**NOT
THIS WAY**

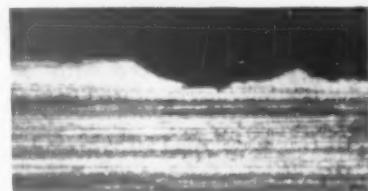


The personal element is bound to be reflected in tools ground free hand. Exact tool shapes are impossible to produce. Undesirable irregularities in the cutting edge cannot be avoided.

Free hand grinding of single-point cemented carbide tools will cut short tool life — and lower production, too. By correctly lapping carbide tools on the Heald Tool Sharpener tool life can be greatly increased since a lapped edge is keener, cuts longer, doesn't break down as fast as a ground edge . . . valuable tool material is conserved because more pieces are produced per sharpening, less material is lost in sharpening . . . better accuracy and finish are obtained as a result of the lapped edge cutting more smoothly, holding its contour longer . . . production is boosted because time lost in resharpening and replacing tools is measurably reduced. Such results cannot be obtained by grinding tools free hand — they must be mechanically lapped on a diamond wheel. Only by positively controlled diamond lapping can absolute regularity of cutting edge and exact nose radii, rake, shear and clearance angles be consistently reproduced. The Heald Tool Sharpener is designed to sharpen tools this way — quickly and inexpensively. Complete details gladly sent on request.



Photomicrograph of tool point lapped with fine grit diamond wheel on Heald Tool Sharpener. Magnification 100X. Note the absolute regularity of cutting edge. This means longer tool life, better finish and accuracy, increased production.



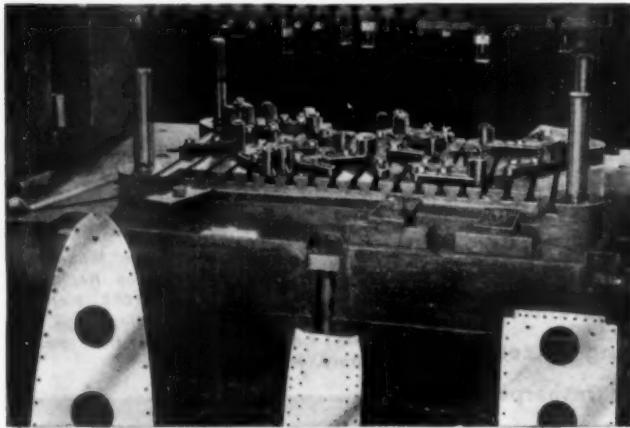
Photomicrograph of tool point ground free hand with fine abrasive wheel. Magnification 100X. Irregularities in cutting edge result in localized stress concentration, then breakdown of the cutting edge and rapid wear.

THE HEALD MACHINE CO. WORCESTER
MASS. U. S. A.

**YOU COULDN'T ASK FOR
ANYTHING MORE SIMPLE
— OR BETTER THAN**

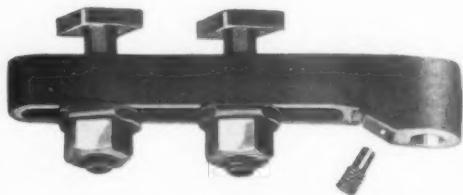
WHISTLER ADJUSTABLE PUNCH and DIE UNITS

Whistler Adjustable Dies work on any type press and because of their simplicity even new workers quickly learn to make pattern change-overs—increasing productive press hours. Absolute precision on short or long runs. Whistler design permits more perforations in a given area—often reducing press operations. For quick and complete information on the advantages of Whistler Adjustable perforating and notching dies send a description or drawing of your work.



These pieces produced with Whistler Adjustable Dies clearly illustrate the re-use of same punch and die units.

These photographs show the simplicity of a Whistler Adjustable Punch and Die assembly. Every piece is interchangeable.



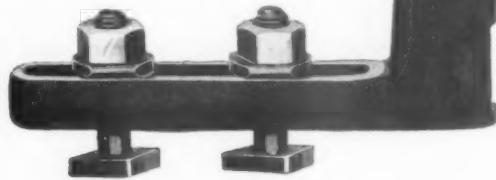
Self-locking bolts on punch holder drop into T slots of die shoe. Set-screw engages into recess at base of punch. Punch cannot turn or pull out in operation.

Punches of finest tool steel are machined to .0001" tolerances.

Stripper unit fits smoothly over punch—no "wobble". Flushed set-screw engages into groove on punch body. Stripper or punch quickly removed when desired.

Grooved heads on dies make lifting from holder quick and easy. Like the punches, dies are held firmly into holder by set-screw in recess at base. Whistler precision is known the world over.

Die holder has self-cleaning slug chute. Special design bolt heads present two bearing surfaces to T slot channel—self-locking, same as used with punch holder. Whistler Adjustable Dies are fully patented.



Write for the Whistler Catalog—every Production Executive should have it.

S. B. WHISTLER & SONS, Inc.
Over 25 Years of Tool and Die Making Experience
752-756 MILITARY ROAD **BUFFALO, N. Y.**

A Complete **TOOL SERVICE**

FOR TURNING, BORING AND FACING OPERATIONS

CARBIDE TOOLS

WITH TANTALUM TUNGSTEN

LEADING THE INDUSTRY IN CARBIDE TOOLS SINCE 1930

The inclusion of Tantalum Carbide in the manufacture of Ramet Cemented Carbide Tools is the reason for their superiority. Tantalum Carbide is an extremely hard material and it imparts to hard carbide compositions a self-lubricating action which minimizes cratering or chip wear.

RAMET STANDARD TOOLS

are complete tools, ready to use, in a choice of 10 styles, 3 grades, and many sizes—164 tools in all. Ramet Carbide Tipped Standard Tools meet a majority of requirements for machining steel, cast iron, and all other materials, and are readily adaptable to special jobs.

RAMET MILLED AND BRAZED TOOLS

have a Ramet Carbide Blank brazed in place. All grinding is done by customer. Any size or shape of shank or grade of blank is obtainable in this classification.

RAMET TOOLS TO ORDER

cover any style or shape of tool made to customer's order. Ramet Cemented Carbide Blanks are brazed in position and tool finished, ground ready to use.

RAMET BLANKS

Cemented Carbide of any shape, grade, or style all obtainable for the customer to make his own tools. A large variety of sizes in two styles and any of the three general purpose grades are available as standard blanks.

FREE Giant poster for display on your shop walls will show new machinists how to lengthen the useful life of your cemented carbide tools.

Published as a service to the industry. A copy of this instructive poster will be sent upon request.

TANTUNG TOOLS

"THE MIRACLE METAL"

THE MOST IMPORTANT CONTRIBUTION TO METAL CUTTING SINCE THE ADVENT OF CARBIDE . . .

TANTUNG IS EFFECTIVE UP TO THE CARBIDE CUTTING RANGE • USE TANTUNG WHERE YOU CANNOT USE CARBIDE

Tantung is a hard, tough, non-ferrous alloy. Its red hardness is far above that of any steel. It is strong and tough and unlike other non-ferrous cutting alloys, Tantung contains Tantalum Carbide.

TANTUNG ECONOMY TOOLS

consist of a generous Tantung bit securely brazed to a substantial steel shank. This construction economizes the use of valuable cutting alloy and adds strength and support. Furnished in square and rectangular tools.

TANTUNG ALL-PURPOSE TOOLS

are furnished with a blank of generous proportions, extending across the entire width of the tool. Blank is securely brazed to a substantial steel shank. Supplied in square and rectangular tools.

TANTUNG SOLID TOOL BITS

are furnished with front clearance and with the gate end notched for identification. Supplied in square and rectangular bits with a full range of sizes.

TANTUNG CUTTING OFF TOOLS

are available in both the rectangular flat and double bevel styles and both are furnished in six standard styles. These tools require grinding.

TANTUNG MILLING CUTTER BLADES

The high red hardness of Tantung Milling Cutter Blades permits high cutting speeds. Inherent strength permits interrupted cuts, heavy roughing cuts, or cuts thru scale and hard spots. The tantalum carbide content makes these blades efficient for milling tough, stringy steel with little or no chip wear.

SPECIAL TOOLS

Made to your specifications. Form tools, boring tools, shell end mills, solid end mills, etc.

4311

THERE IS A RAMET BRANCH

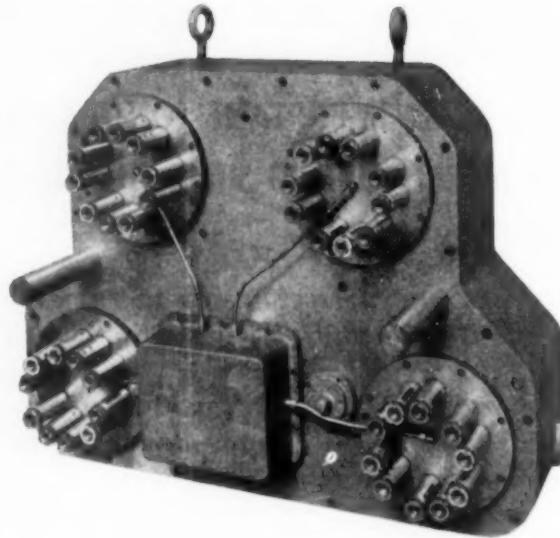
Ramet

AS CLOSE AS YOUR TELEPHONE

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILL. • DISTRICT SALES AND SERVICE IN PRINCIPAL CITIES
IN CANADA: CARBIDE TOOL AND DIE COMPANY, HAMILTON, ONTARIO

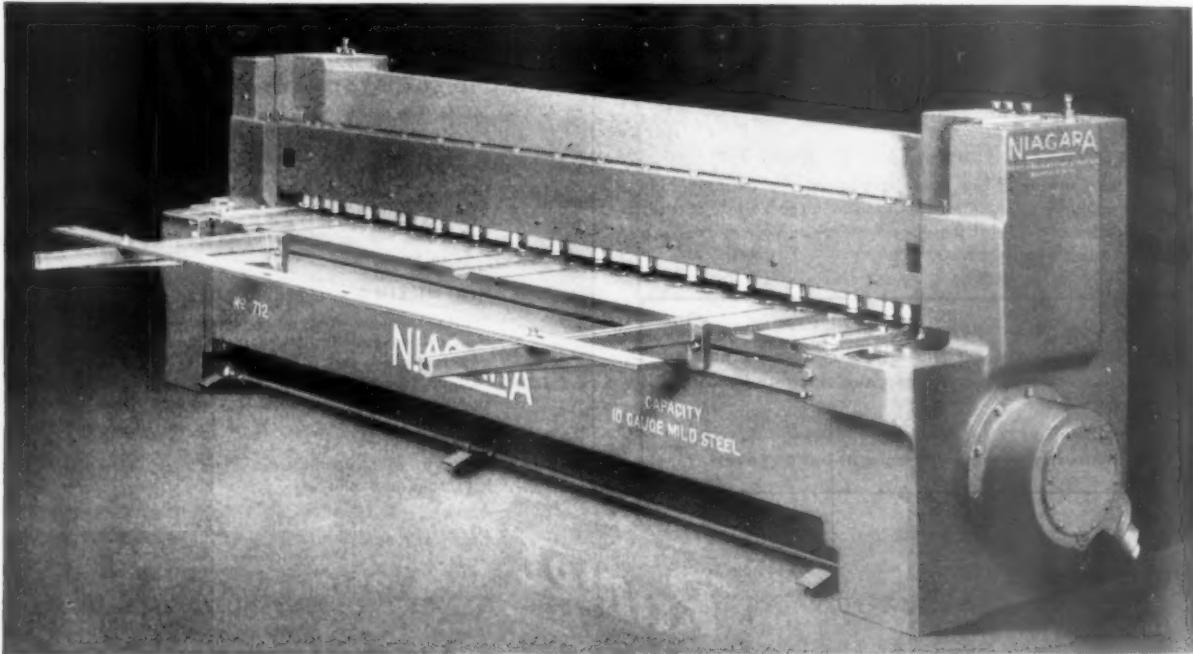
"If it's a *Buhr* Multiple Production Drill Head, it's good for 24 hour production."



Forty-spindle Buhr drilling and reaming head. For drilling and reaming holes in Aircraft Motor Cylinder. Vertical adjustment in all spindles. An oil pump provides positive lubrication.

BUHR MACHINE TOOL CO.
ANN ARBOR MICHIGAN

Specialists in Multiple Spindle Drilling,
Boring, Reaming, and Tapping Equipment



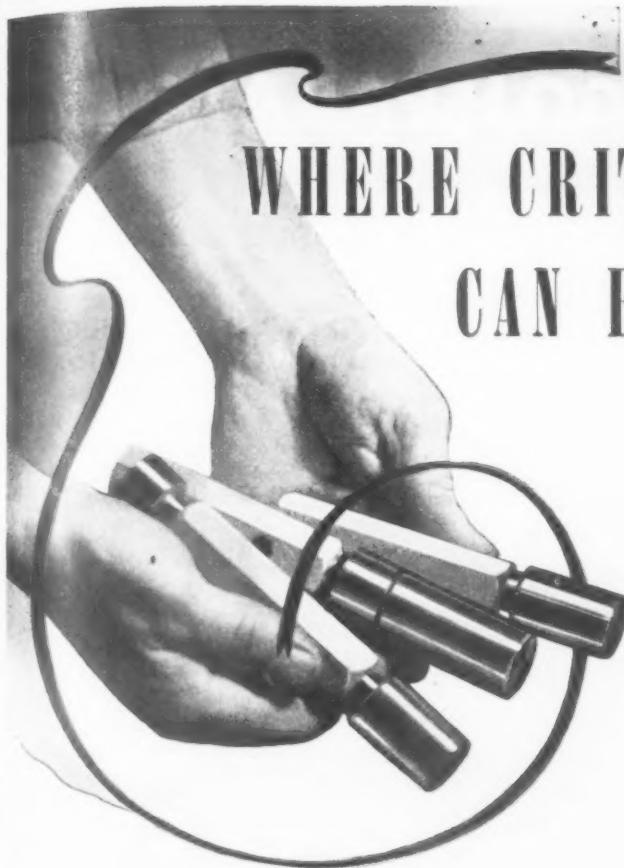
The wide and well-graduated range of Niagara Power Squaring Shears offers the most productive machines for the many requirements of war plants. They cut sheared edges and narrow strips straight to within a few thousandths of an inch. They are arranged for convenient operation to speed up squaring and trimming. Niagara Machine & Tool Works, Buffalo, N. Y. District Offices: Detroit, Cleveland, New York.

Shear knives available for cutting alloy and special steels. Let us know what you desire to cut. Prompt delivery on spare knives for Niagara Squaring Shears. Also factory regrinding service by the same skilled men who grind new Niagara knives.

BUY UNITED STATES WAR BONDS AND STAMPS

WHERE CRITICAL MATERIALS CAN BE

Conserved



By The Use Of
HARD CHROME PLATING

By The Use Of
CARBOLOY
CEMENTED-CARBIDE

Wear-resistance in gages can provide the means to save critical materials—used both in the manufacture of the gages themselves and in parts which require extremely accurate inspection.

New gages supplied in hard chrome plate or Carboloy cemented-carbide have much greater life than those made of steel. It is obvious that, by their use, in high production gaging, the amount of steel required for ordinary gages—in quantities which will provide proportionate inspection usefulness—can be used for other purposes. In salvaging worn steel gages by chrome plating, no new steel is required and the life of the gage is increased to approximately five times its original period of service.

Of equal importance, is the increased manufacturing tolerances made possible by the use of wear-resistant gages. Chrome plated and Carboloy gages produced by Lincoln Park can be specified extremely close to required limits. Allowance for wear can be reduced considerably, automatically adding to manufacturing tolerances. This slight extra percentage of tolerance is especially important when parts being inspected are very close to required limits. It eliminates rejections of parts that should be accepted which, in many cases, results in great savings in expensive parts—and the critical materials used in them—and in man and machine hours.

HARD CHROME PLATE—Provides approximately five times the wear-resistance of steel. Lincoln Park—with complete, modern facilities for preparation, plating and finishing—supplies new chrome plated gages and also salvages worn steel gages by plating. A new service is also offered in the salvaging by hard chrome plating of worn surface plates.

CARBOLOY—Provides more than fifty times the wear-resistance of ordinary gages. Lincoln Park pioneered the use of these cemented-carbides in gage manufacture, and for a number of years has been the largest user of Carboloy in the gage industry. A wide variety of gages and non-cutting precision tools of this material are now produced in the Lincoln Park plant.

L

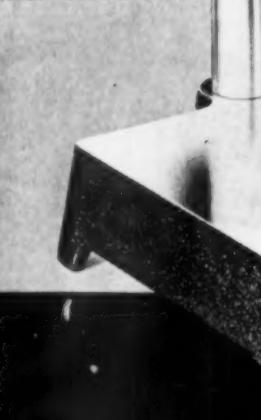
LINCOLN PARK TOOL and GAGE CO.

LINCOLN PARK, MICHIGAN

AMES

No. 13 COMPARATOR

.001" Model \$30.00
.0005" Model \$30.00
.0001" Model \$45.00



For accurately measuring large, small and odd shaped parts speedily, this No. 13 Comparator is popular and attractive. The 8" square base is ground flat on top and often fitted with V blocks, anvils and stops of various kinds. The bracket which holds the 2 1/4" indicator extends 4" over the base and is adjustable for measuring up to 6".

There are many uses for this inexpensive, durable, high-grade Comparator in every shop where accuracy is essential.

SEND FOR
CATALOG

B. C. AMES CO.
WALTHAM, MASS., U. S. A.



HERE'S EXTRA-FAST HEAT RECOVERY!



Despatch Furnace Regains Heat in Record Time, Yet Won't Overshoot!

When you open the door of a Despatch furnace to run in a cold charge — don't worry about heat loss.

Recovery to desired temperature is so fast, so precisely controlled, that your heaviest charge is up to heat in minimum time. And — there is no over-shooting.

This feature — the result of an improved, faster airflow and heat distributing system — improves your heat treating production tremendously.

HANDLES LARGE LOADS easily with uniform heat through entire chamber and load.

PROCESSES ACCURATELY so that all batches receive same treatment. Very dependable.

HAS WIDE UTILITY for dozens of heat processes between 275°F. and 1250°F. Quick accommodation of new temperature settings.

STANDARD SIZES available in electric or gas-fired models:

CF- 9 13" x 13" x 13"
CF-17 19" x 19" x 19"
CF-25 37" x 19" x 25"
CF-31 37" x 25" x 37"

(Inside dimensions; width, length, height).
PROMPT DELIVERY of standard models.

WIRE OR WRITE today for full details.



Batch type CF-9 Despatch forced convection furnace for heat-treating precision parts, dies, tools and castings.

ASK for Bulletin 83-T

DESPATCH OVEN COMPANY
MINNEAPOLIS MINNESOTA



**PROPERLY DESIGNED
DROP FORGINGS**

Airplane propeller hub being forged on Chambersburg Steam Drop Hammer

THE solution of the increased load thrown on the forging industry lies not only in the use of modern equipment... such as Chambersburg Hammers... but also in properly designed forgings... which mean less metal... and less machining. Less metal for each forging, less machining necessary to finish, fewer man-hours per piece and less horsepower mean savings of vital importance NOW.

CHAMBERSBURG ENGINEERING CO. • CHAMBERSBURG, PA.

THE CECOSTAMP • A NEW METHOD OF PRODUCING AIRPLANE STAMPINGS

A new, high-production, easily controlled, impact-type drop stamp, designed by Chambersburg Engineers after a close study of aircraft manufacturing requirements. In the rapid production of drop stampings from stainless steel, high strength aluminum alloys and other metals of low ductility, the CECOSTAMP has taken its place with the newer tools and techniques made necessary by this great industry.

CHAMBERSBURG
HAMMERS • CECOSTAMPS • PRESSES



Since 1940, when the advertisement shown at the left was first run, Chambersburg Engineering Company has been urging the careful design of drop forgings to eliminate excess scrap, excess machining, excess man hours. The Buick advertisement shown below is an excellent example of careful design—plus Chambersburg Hammers.

*A Case of
LESS SCRAP, MORE FIGHT*

This sleek and polished example of super fine machining is a propeller shaft for a Buick-built Pratt & Whitney aircraft engine.

It used to be cut by slow and painful whittling from a forging made from a 180-pound bar of steel.

By changing the forging method, Buick found a way to get the same results from a steel bar weighing only 165 pounds.

Nineteen pounds less material to be cut away, 19 pounds less scrap to be sent back for remelting, considerably

less expenditure of precious machine tools and—111 propeller shafts from the same material that used to deliver only 100—in less time per shaft!

The country needs scrap metal—all you can dig up.

It also needs to avoid waste of materials in the making of fighting tools.

Do your share in "getting in the scrap"—and we'll do ours, in this and other instances like it, to get the utmost "fight" out of the materials we work with.

CHAMBERSBURG

HAMMERS • CECOSTAMPS • PRESSES

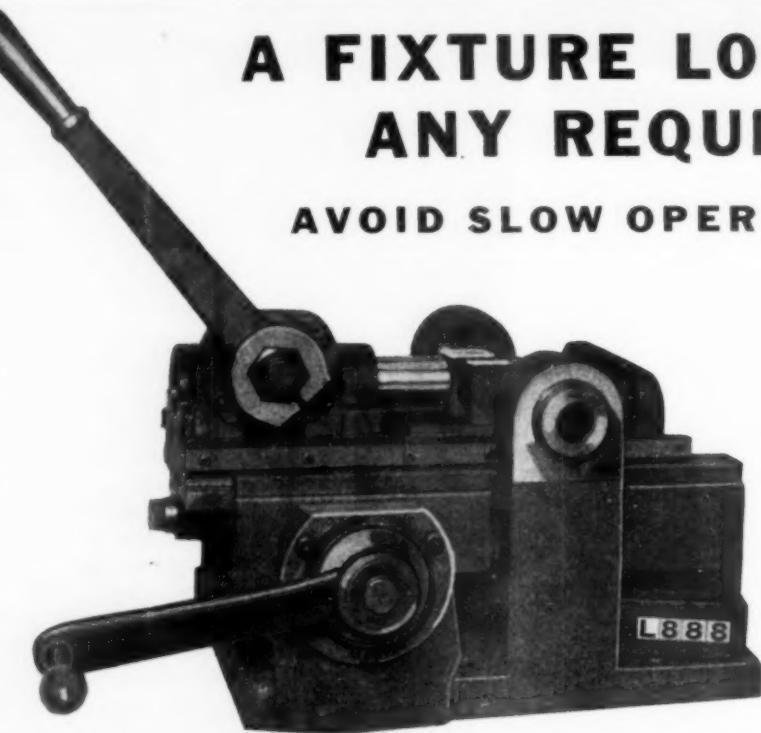
Chambersburg Engineering Co.

Chambersburg, Pa.

GENERAL MOTORS
BUICK DIVISION OF GENERAL MOTORS

A FIXTURE LOCK TO SUIT ANY REQUIREMENT

AVOID SLOW OPERATING CLAMPS



Both Single and Double Action Locks are used in this Tooling.

The Single Action Lock Clamps the part, while the Lower or Double Action Lock securely holds the Movable Carriage in the desired position against stops.

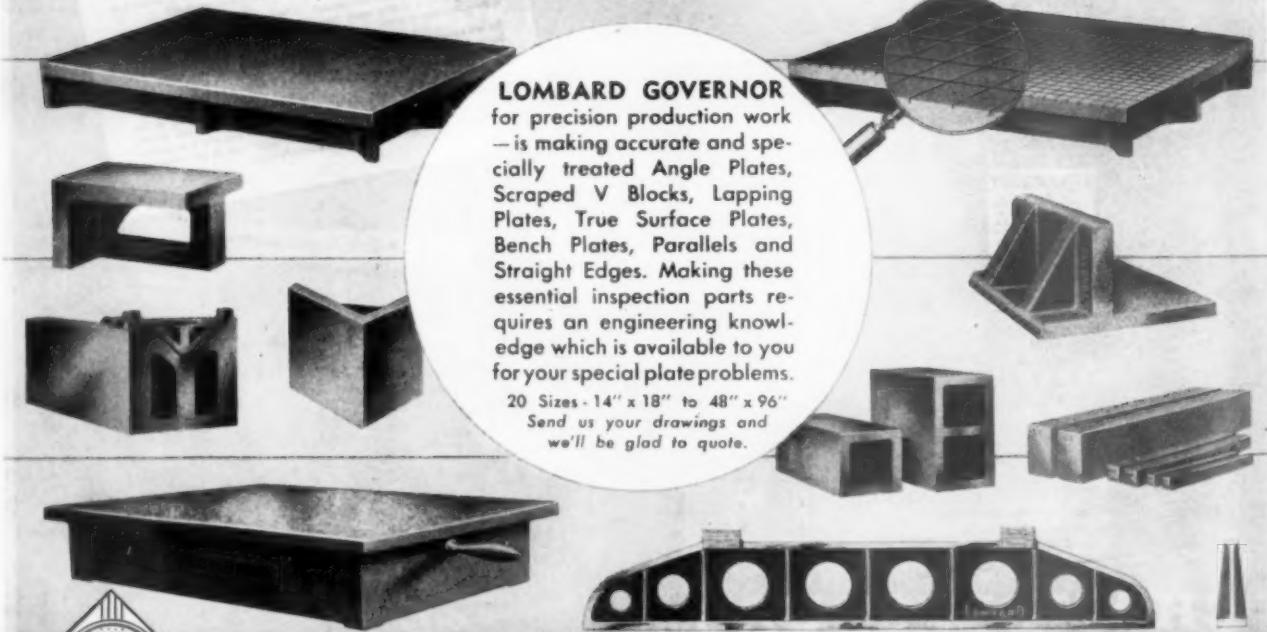
SWARTZ TOOL PRODUCTS CO., INC.

13330 Foley Ave.

ASK FOR CATALOG 941

Detroit, Michigan

For Speedy Delivery

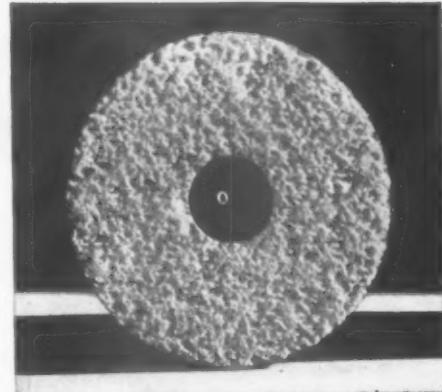


LOMBARD GOVERNOR CORPORATION
100 MAIN ST., ASHLAND, MASS., U. S. A.

Which Wheel Structure for YOUR Job ... *Dense, Medium, Open?*

MOST ordinary tool and cutter jobs and surfacing jobs require either the fairly dense No. 5 structure or the medium No. 8 structure, the choice being dependent on the size and shape of the tool or part and the area of contact. There are jobs however where the Norton very open, No. 12, structure (illustrated) will be found best, such as:

- (1) Surface grinding with periphery of wheel of hard, heat-sensitive steels.
- (2) Hob grinding, especially when heavy cuts must be taken.
- (3) Form tools or other grinding where accurate contours are required, except where acute included angles are involved. (Structure



No. 12 Structure (Open)

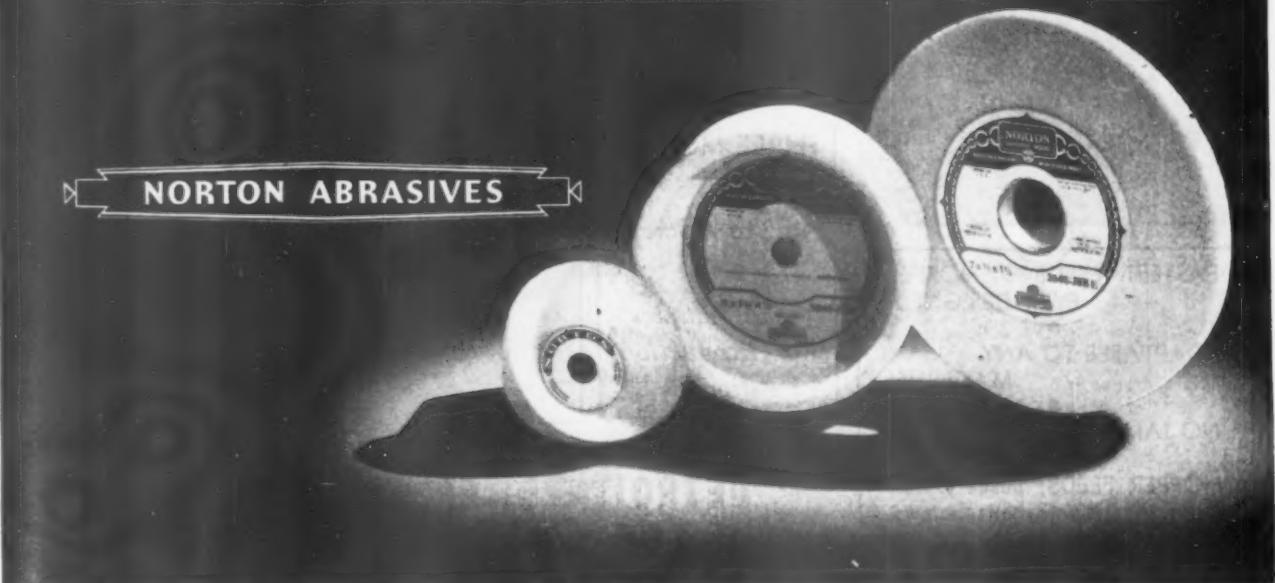
No. 12 wheels, because of their large pores, should not be trued to a sharp, thin point.)

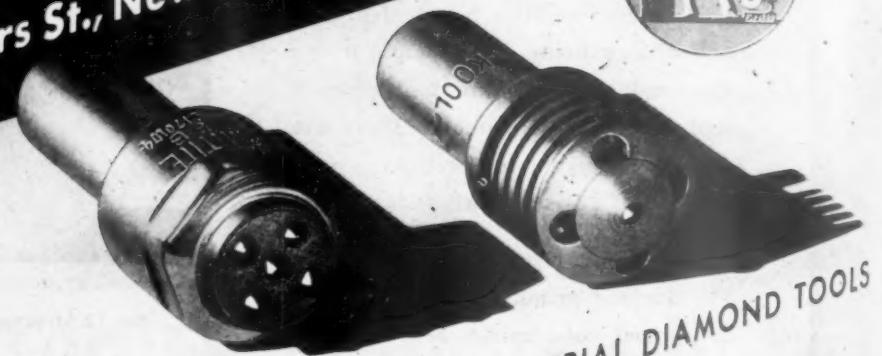
Norton engineers will be glad to study your toolroom and surfacing jobs and select the wheel structure which will be best for each one.

NORTON COMPANY, WORCESTER, MASS.

W.892

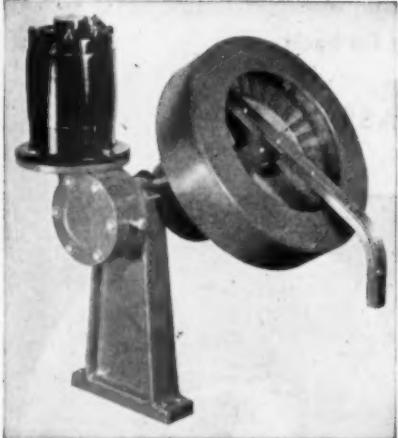
NORTON ABRASIVES





INDUSTRIAL DIAMOND TOOLS

HOPPERS and SCREWDRIVERS



FASTEST FEEDING HOPPER
EVER DESIGNED!

- ADAPTABLE TO ANY
MACHINE!

- NO JAMMING OR LOCKING!

HOPPER FEEDS: Bullet Cores,
Rings, Pins, Rivets, Nuts, Screws,
Discs, and Special Parts.

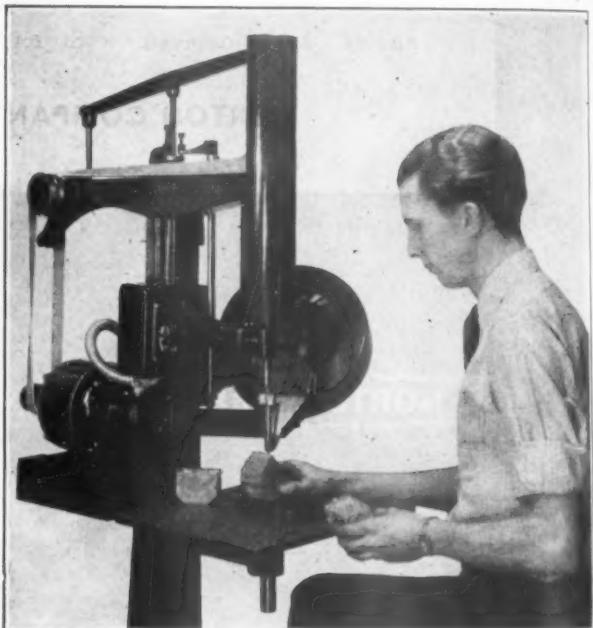
DRIVE SCREWS
the
MODERN WAY

- REDUCE COSTS
INCREASE
PRODUCTION

- THREE MODELS

- No. 2 to $\frac{3}{8}$ Screws

- Send Samples
For Production
Estimates



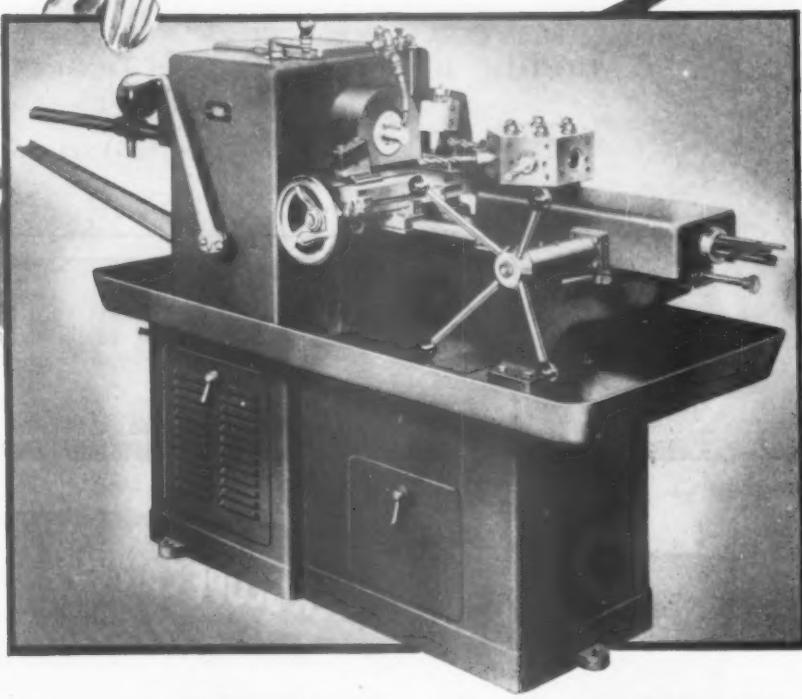
DETROIT POWER SCREWDRIVER CO.

2805 W. FORT STREET

DETROIT, MICHIGAN



"MY BROTHER'S
IN THE SERVICE SO
I TOOK HIS JOB!"



and I learned to run his Oster in a jiffy!"

Men leaving machines for military service. Experienced operators frozen to jobs. Only solution is rapid training of new operators. It's a serious problem with complicated machines. Not so with the Oster No. 601 "RAPIDUCTION" — the *SIMPLIFIED* Lathe now equipped with automatic indexing of its 6-station turret.

Capable of handling a wide variety of bar and

chucking operations, including unusually heavy forming cuts, Oster "RAPIDUCTION" Turret Lathes have *SIMPLIFIED* the problem of training new operators rapidly to necessary standards of efficiency.

Does this seem to offer **YOU** at least **ONE** solution to **YOUR** problems of man-power shortage? If so, use the form below **NOW!**

No Time Out to
Celebrate Our
50th
ANNIVERSARY
1893-1943

OSTER

THE OSTER MFG. CO., 2063 E. 61st ST., CLEVELAND, OHIO, U.S.A.

We are seriously interested in the Oster No. 601 "RAPIDUCTION" Turret Lathe. Please send Catalog No. 601 at once.

NAME _____

ADDRESS _____

CITY _____ STATE _____

- ★ HOBS
- ★ REAMERS
- ★ COUNTERBORES
- ★ GEAR SHAPER CUTTERS
- ★ BROACHES
- ★ CIRCULAR AND FLAT FORM TOOLS
- ★ SLITTING SAWS
- ★ SPECIAL TOOLS
- ★ GEAR CUTTERS
- ★ MILLING CUTTERS



National metal cutting tools made to order
for manufacturing today's wartime imple-
ments and tomorrow's peacetime products.

NATIONAL TOOLS HAVE AN INTERNATIONAL REPUTATION

The NATIONAL TOOL Co.

11200 MADISON AVENUE

CLEVELAND, OHIO

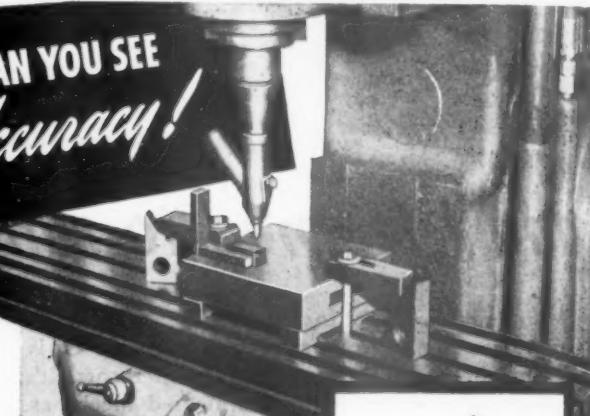
ONLY WITH THE CENTER SCOPE CAN YOU SEE
TO GET Unquestioned Accuracy!

AND ONLY WITH THE CENTER SCOPE IS ACCURACY SO SIMPLE!

There is no mystery about the Center Scope's accuracy—its magnification (45) enables you to see and to locate "within a tenth" regardless of the tolerances allowed. Thus with tolerances to spare you get unquestioned accuracy on every job.

On a vertical mill as illustrated, when measurements of extreme accuracy are needed, high precision boring can be done with the Center Scope and Edge Block without worry regarding lead screws, back lash or table inaccuracies. Lay a stack of size blocks of the right length flat on the work piece. With one end tight against a parallel held flush to the edge of the work—place an Edge Block on the other end and center it to the spindle axis. This method of locating with the Center Scope is fast and practical—it speeds production—eliminates the source of errors—and gives you at all times UNQUESTIONED ACCURACY!

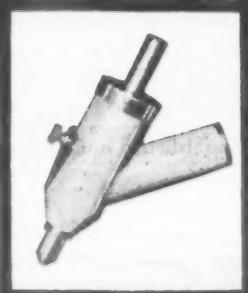
CENTER SCOPE INSTRUMENT CO.
351 South La Brea, Los Angeles, Calif.



The CENTER SCOPE

—is an optical locating and centering tool that can be used on any machine. It's a rugged shop tool that quickly and accurately compensates for spindle or adaptor run-out, makes old machines more versatile, and easily locates edges to spindle axis.

Used directly "on the job"—the Center Scope is not affected by wear or changes in temperature—nor is it affected



ed by mechanical pressure, for it never touches the work!

The Center Scope is the only instrument that enables you to see that you are unquestionably right!

"AN EYE



FOR ACCURACY"

**GRINDING
TIME CUT
IN $\frac{1}{2}$**

**with
MATTISON
GRINDERS**



**4 TIMES AS MANY SMALL PARTS PER LOAD
BECAUSE OF GREATER GRINDING AREA**

At the Sundstrand Machine Tool Company, grinding time on small parts has been cut in half with their Mattison High-Powered Precision Surface Grinder. One reason for this substantial saving in grinding time is the greater load and grinding area of their Mattison Grinder. To illustrate — gear parts shown on the above machine were formerly ground 6 pieces per load. With the Mattison Grinder, 28 pieces are ground simultaneously. Similarly the Lathe Slides were formerly ground one at a time. With the Mattison — 4 pieces can be held in the grinding area. Both of these jobs are held to within limits of a few tenths. On numerous other small parts similar results are obtained. Double column construction for the wheel slide assembly and other construction features enable users of Mattison Surface Grinders to get repeated precision results on a high production basis. Machines are offered in a wide variety of sizes to meet every requirement from 12" to 36" wide by 36" to 192" long. Write for the free Set-Up Book, containing further examples, showing how others have reduced time and increased production with Mattison Grinders.

28 Gears per table load . . . compared to 6

4 Lathe Slides per table load . . . compared to 1

**SET-UP
SHEETS**
Containing complete information regarding these and similar jobs will be sent upon request.

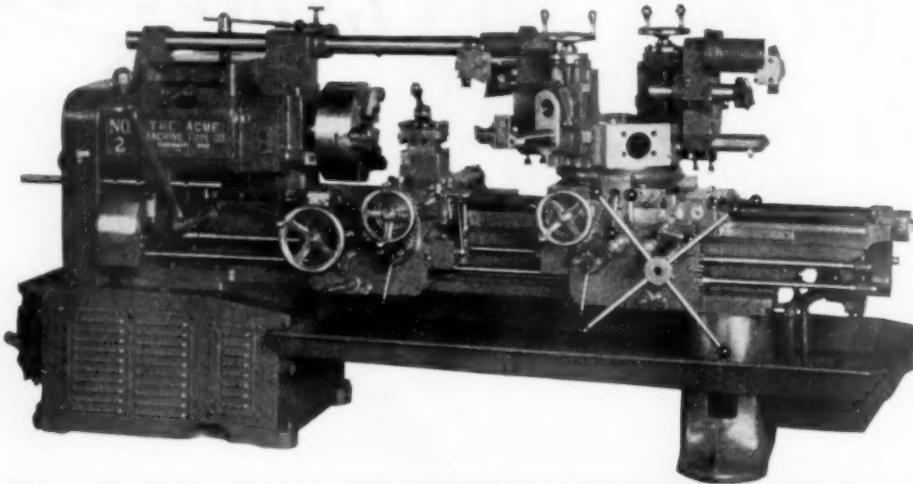


MATTISON

MACHINE WORKS

ROCKFORD • ILLINOIS

RIGIDITY and ACCURACY UNDER HEAVIER CUTS AT FASTER SPEEDS!



No. 2 Universal Turret Lathe with stationary overhead pilot bar and headstock brackets. Heavy duty multiple turning heads and vertical side tools and heavy duty reversible cutter holders. Also shown is the lead screw type chasing attachment with split nut brackets and threading dials on both carriages.

This machine with its stationary overhead pilot bar and headstock brackets together with rigid turret tooling permits heavy multiple cuts. Thus accuracy is assured, while faster speeds are possible through the use of cemented carbide cutting tools.

WRITE FOR COMPLETE DETAILS

THE ACME MACHINE TOOL COMPANY
CINCINNATI, OHIO

A Handful of Help FOR USERS OF OK TOOLS



LOOK
FOR THESE
TAGS ON
OK TOOLS

When you receive an OK Tool with one of these tags attached to it, in your own interest, be sure to remove and read it carefully. These tags all contain information that will go far to make the tools last longer and do better work . . . useful hints about metal cutting in general, how to reblade, etc.

There's a wrong and a right way to use a cutting tool. In these days, when machine operators are still in the learning stage, they need simple, practical help. In the main, this should come from the "old man" in charge of the department, but the information on these tags will afford the novice a good beginning.

TRADE
OK
MARK

INSERTED-BLADE METAL CUTTING
TOOL SYSTEM
MANUFACTURED ONLY BY THE **OK TOOL COMPANY**, SHELTON, CONN., U. S. A.



A FAST FINISH and A SAFE BET

EGYPTIAN MACHINE TOOL FINISHING SYSTEM WINS FRIENDS and SATISFIES WPB.

You can't lose when you specify this new three coat system. Here's what you get. Listen!

- 1 Complies with WPB Limitation Order L-108.
- 2 Stipple effect completely camouflages rough spots in casting. Smooth finish when desired.
- 3 No primer required.
- 4 Spray or brush.
- 5 Any make stipple equipment may be used.
- 6 Finish levels or rounds out as it dries.
- 7 Fast, air drying. No bake.
- 8 Resistant to oils and alkalis.
- 9 Only two coats for stipple effect. One coat of EGYPTIAN Machine Tool Enamel completes job.
- 10 True EGYPTIAN uniformity and quality in every drum.

Check each of these vital factors. The answer: EGYPTIAN—a sure winner.

Why not try it? Write us your requirements. Address Dept. T.

Do You Use Gov't Specification Finishes?

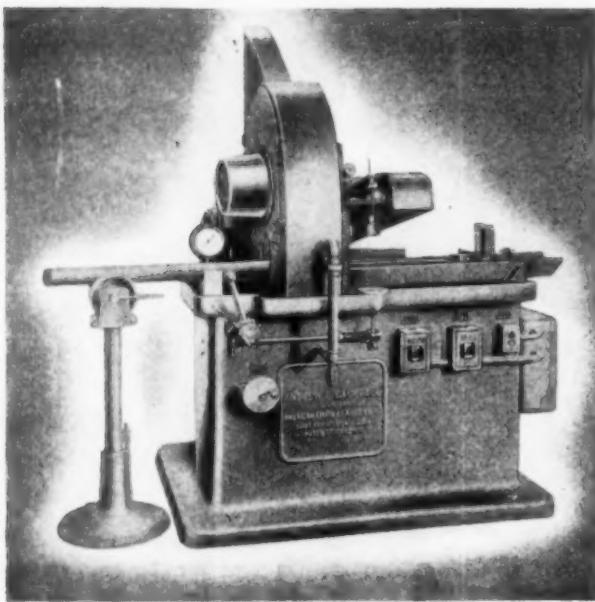
If so, you will want our new book giving the more important ones made by EGYPTIAN. Just ask for "Spec" Book T



THE EGYPTIAN LACQUER MANUFACTURING CO.
ROCKEFELLER CENTER, NEW YORK, N. Y.

EGYPTIAN

Superior FINISHES



No. 401 CAMPBELL CUTAMATIC. Abrasively cuts steel up to 6" dia. Hydraulic Clamping and wheel feed. Proper coolant control.

FOR ABRASIVE CUTTING

CHECK WITH

Campbell

CAMPBELL offers the only complete range of
Abrasive Cutting Machines—8 types, 19 models.

You will find it worthwhile to check with the CAMPBELL Engineering Department on your abrasive cutting whether you cut any grade of steel, annealed or unannealed; non-ferrous alloys—solid bar, tubular or flat.

Send us complete data—material, size, length before cutting, length of cut-off pieces, production required per hour. With that as a starter, we will work out production procedures and costs for you.

Be sure to get a copy of this new authoritative booklet "Abrasive Cutting"—28 pages of valuable data for anyone doing production cutting.



Campbell

ABRASIVE CUTTING MACHINES

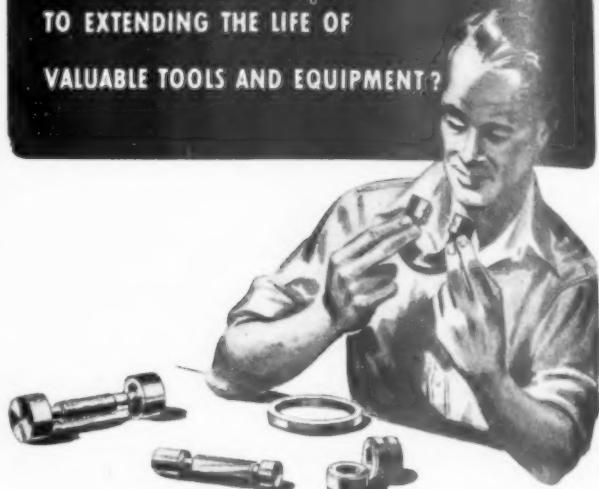
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT



AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

IS CHROMIUM PLATING YOUR ANSWER
TO EXTENDING THE LIFE OF
VALUABLE TOOLS AND EQUIPMENT?



GAUGES for example—

CHROMIUM PLATING may reclaim them — give them longer, more accurate life!

WORN GAUGES should not be scrapped today without first determining whether they can be reclaimed, simply by chromium plating the gauging surfaces slightly oversize and then finishing to the correct dimensions. Your present stock of gauges thus treated can be made to last indefinitely, for chromium plating will bring them back to size over and over again.

In addition, performance of these gauges shows a marked increase in life—in some cases as much as seven or eight times that of unplated gauges. Extreme hardness and abrasion-resistance of chromium is the answer. Also the non-galling property eliminates seizing. And the exceedingly fine polish obtainable permits gauges to be finished to a desired size or shape without any of the defects usually present in a burnished surface.

FOR MANY OTHER TOOLS AND PARTS

This is just one of countless ways in which chromium plating saves valuable man-hours and materials for war production . . . by extending the life of a wide variety of parts subject to wear and corrosion . . . by reclaiming many hard-to-replace machine tools and parts which have been worn or machined off-size and would otherwise have to be scrapped.

The helpful booklet shown right describes these applications in detail. A copy of "The Last Thousandth of an Inch that Speeds Production" is yours for the asking. In writing please mention "The Tool Engineer".

This booklet describes many applications ➤



UNITED CHROMIUM INCORPORATED

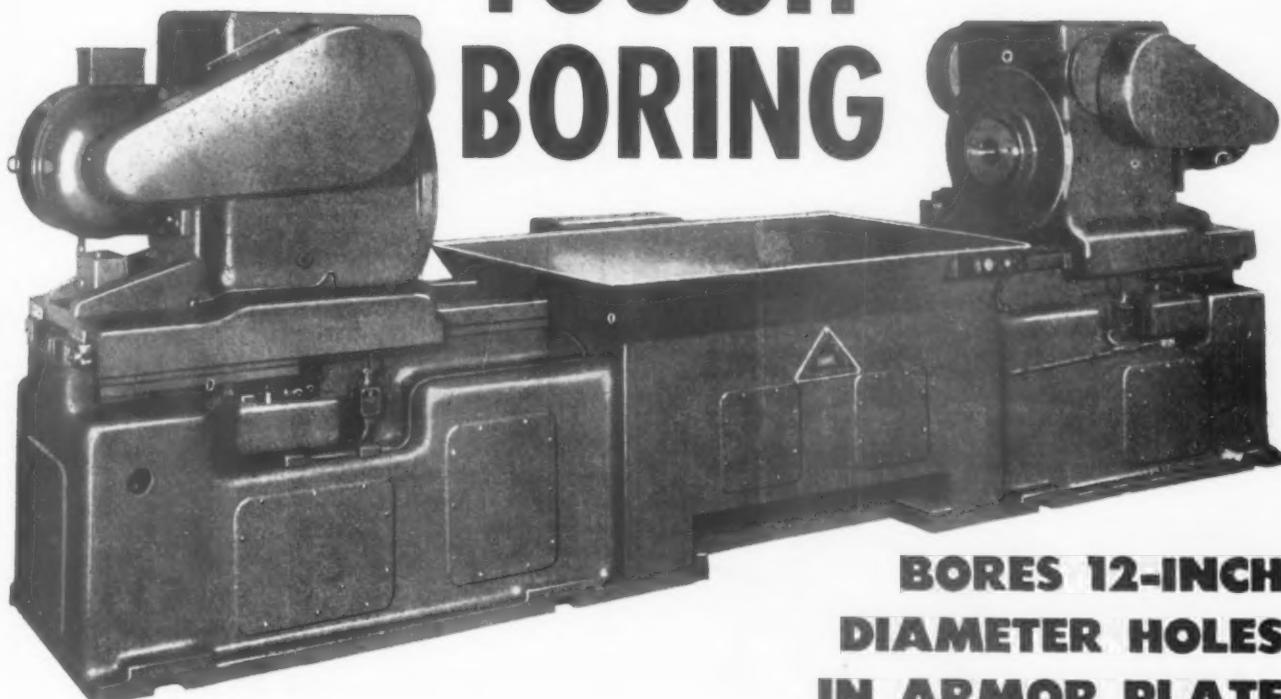
51-East 42nd Street, New York, N. Y.
Waterbury, Conn. Detroit, Mich.

THE TOOL ENGINEER

ARMOR BORING

This powerful machine engineered and built by LeMaire

for TOUGH BORING



**BORES 12-INCH
DIAMETER HOLES
IN ARMOR PLATE**

LeMaire again meets a difficult problem!

When a manufacturer asked for a machine to bore large diameter holes in heavy armor plate, this is the machine that resulted.

It bores 12-inch diameter holes in each end of the part. The speed of the extra-large spindles, carried by the heads, can be changed by means of pick-off gears. The hydraulic system is arranged for rapid advance feed and rapid return. Adjustments provide selective feeds. The hy-

draulic cylinders possess oversized capacity to insure even feed and to give ample thrust capacity at the spindles.

The one-piece cast iron bed, heavily ribbed, supports ways which have been purposely made wide to reduce bearing loads on the slides. Since the alignment of the holes in the work is held within very close limits, the machine is engineered with extra strength built-in at all points to hold distortion down to a minimum.

Perhaps you would like your production to gain a few more parts per hour. Perhaps we can design and build a machine to meet your increased schedules. A consultation with us will not obligate you.

**BUY
WAR BONDS**

ENGINEERS AND BUILDERS OF PRODUCTION MACHINES

L & Mairé TOOL & MFG. CO.
2663 S. TELEGRAPH ROAD DEARBORN, MICHIGAN

IDEAL METAL ETCHER

Permanently Marks Everything
Made of Iron, Steel or Their Alloys



Electrically marks important information on smooth-surfaced Parts, Tools, Dies, Gauges, etc., 14 Heats—115 to 1300 Watts. Low heats for fine lines on small and thin parts—high heats for bold lines on large and heavy parts.

Etches legibly, easily, permanently regardless of the hardness of the tool or part. Convenient ground clamp for etching large, heavy parts and castings.

MOST COMPLETE LINE ON THE MARKET

Triple-Duty*

IDEAL
LIVE
CENTERS



Turn Heavier Loads At Higher Speeds

On Lathes, Millers, Grinders, turning today's heavy loads at high speeds is no problem when you have IDEAL Live Centers. They rotate with the work, on selected precision ball and taper roller bearings.

*Three Interchangeable Center Pieces are available; to meet the needs of all types of centered and uncentered work. Exclusive IDEAL feature. SAVE SET-UP TIME.



FREE

Machine Tool Accessories Catalog

Gives full details on IDEAL Live Centers, Demagnetizers, Marking Tools, Balancing Ways, and other Machine Tool Accessories that speed production and keep costs down. Send for your copy, today.



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SALES OFFICES IN ALL PRINCIPAL CITIES
In Canada: Irving Smith, Ltd., Montreal, Quebec

Engineering
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BONDED MATERIALS



New Giant War Cargo Plane
Constructed of Non-Critical Materials

Consultants In Primary and Secondary Gluing Problems

Designing of Jigs, Tools, Fixtures, Gages, Dies, and Special Machines

If there is a bottle-neck in your production of aircraft, either metal or bonded materials, turn over the problem to us for solution. Leading manufacturers of aircraft are constantly calling on us for this type of service, finding that it saves them both time and money.

WRITE US!

Outline briefly the nature of your production problem and you will hear from us promptly.



American
Designing & Engineering Co.

1209 WASHINGTON BOULEVARD

DETROIT, MICHIGAN

Important!

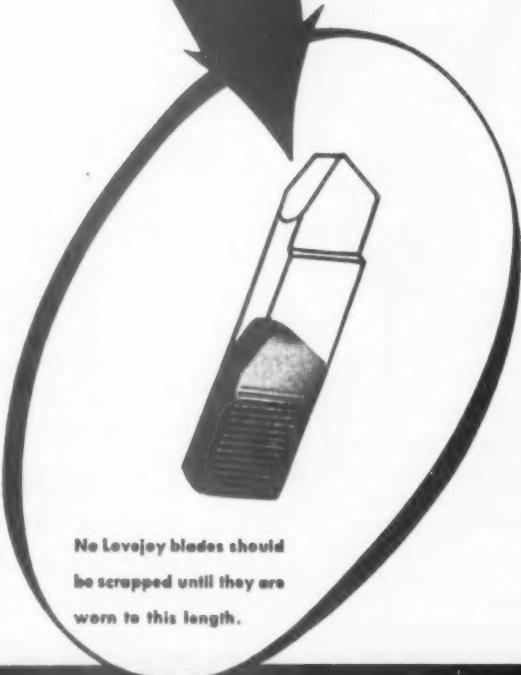
NO BLADE USED IN A LOVEJOY
TYPE "A" MILLING CUTTER
SHOULD BE DISCARDED UNTIL
50% (OR MORE) HAS BEEN USED!

High Speed Steel and other cutting alloys are scarce. That is why we urge you now, as always, to take full advantage of Lovejoy's exclusive Positive-Locking device for holding the blades in Lovejoy Type "A" Milling Cutters.

This feature is your assurance that over 50% of Lovejoy blades may be used before they must be scrapped—also your assurance that short blades are held as rigidly as new blades.

When your blades have been used to the limit, sell them to your scrap dealer, then order new blades out of our stock.

Worn out Cemented Carbide blades may often be salvaged by using Lovejoy's retipping service — information on request.



BREAK YOUR TAPPING BOTTLENECKS

with

**Ettco-Emrick
TAPPING
ATTACHMENTS**

No need to let a lack of tapping machines hold up your production. Get the extra tapping capacity you require from your drill presses. Ettco-Emrick Tapping Attachments

will turn them into high-speed, sensitive, accurate tappers. Attachments are easily mounted on any drill press without altering the presses in any way. Quill Clamps are available to assure the absolute rigidity needed for high precision work.

There's nothing experimental about these Attachments. Thousands of them have been in successful use for many years in shops all over the country. The exclusive Ettco-Emrick features of design are your guarantee of top-notch performance and service.



7 Sizes
for No. 0
to 1" Taps

SAVE TIME

In solving your tapping problems. Our 25 years of specialization in machine tapping are always at your service. Write us.

BULLETIN No. 2 GIVES YOU FULL DETAILS

A copy will be mailed to you on request. Write for it today.

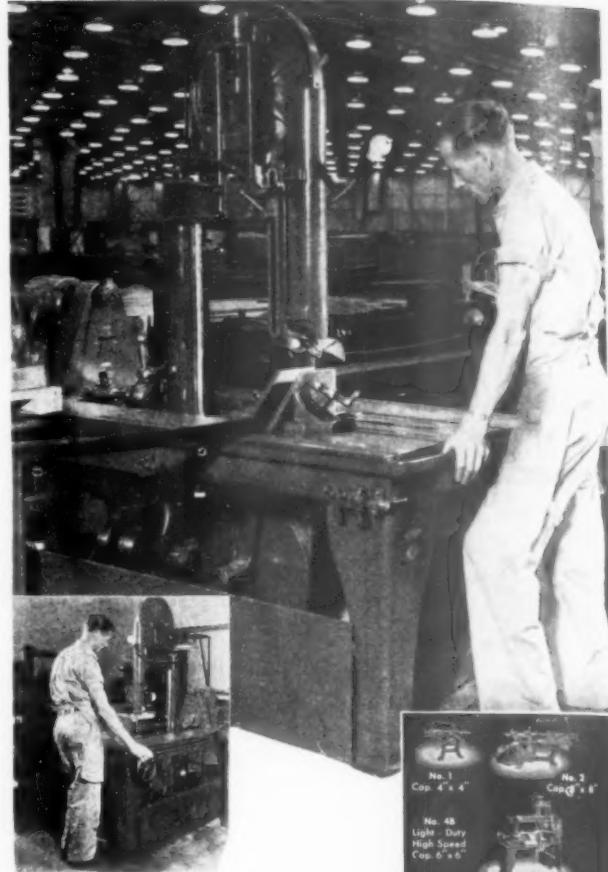
ETTCO TOOL CO.

586 Johnson Ave., Brooklyn, N. Y.

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CHICAGO

The Famous
Ettco-Emrick DRILL CHUCKS • TAP HOLDING CHUCKS
TAPPING ATTACHMENTS • TAPPING MACHINES
MULTIPLE SPINDLE TAPPING AND DRILLING HEADS
Unexcelled for Design, Materials and Workmanship



Cutting standard steel shapes at the Douglas Aircraft Company's new Long Beach plant...

MARVEL Saws were chosen to help the "production of the largest possible number of the finest possible airplanes in the shortest possible time."

In the great new "blackout" Douglas Aircraft Co. plant where even the doors are light trapped and even the brightest moonlight can find no reflection surface — where every piece of equipment is the finest, MARVEL SAWS are found at strategic points, helping to speed the production of the world's most powerful bombers.

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SAWS**

ARMSTRONG - BLUM MFG. CO.

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THE TOOL ENGINEER

**TO PUNCH OVER 200 HOLES AT ONCE
IN EXTRUDED AND SHAPED SECTIONS**

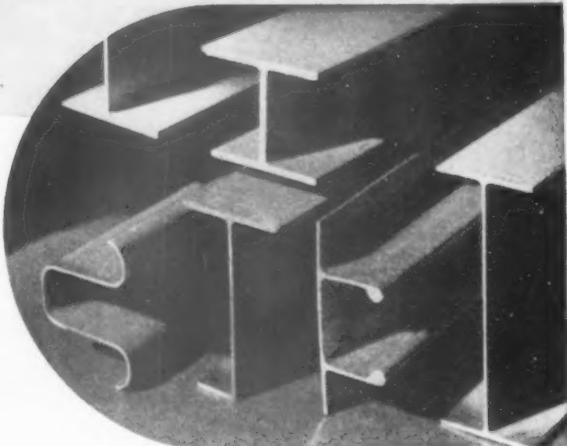
use **WALES TYPE "E" UNITS**

For the first time, punching over 200 holes simultaneously in various shapes and angles is a quick and easy press brake operation.

Wales Type "E" Hole Punching Unit is designed with center projection to carry die and provide clearance for legs on angles in lower gap.

Each Wales Type "E" Unit can be instantly reset on rail to provide unlimited center-to-center hole punching patterns. Other Wales time-saving, money-saving features:—nothing is attached to press ram . . . punch and die holder is self-contained unit . . . punch and die are always in perfect alignment . . . interchangeable punches and dies punch various sizes and shapes with same holders . . . die setting time and press "down time" are cut from hours to minutes.

"There's Always Something New in the Wales Line" so keep posted by writing to —



A few of many shapes that have been punched by Wales Type "E" Units.

**CALL ON STRIPPIT ENGINEERS
TO SOLVE YOUR HOLE PUNCHING PROBLEMS.**

THE STRIPPIT CORPORATION, North Tonawanda, N. Y.

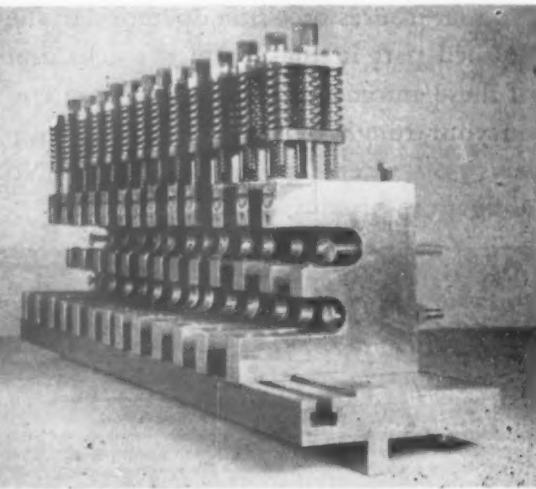
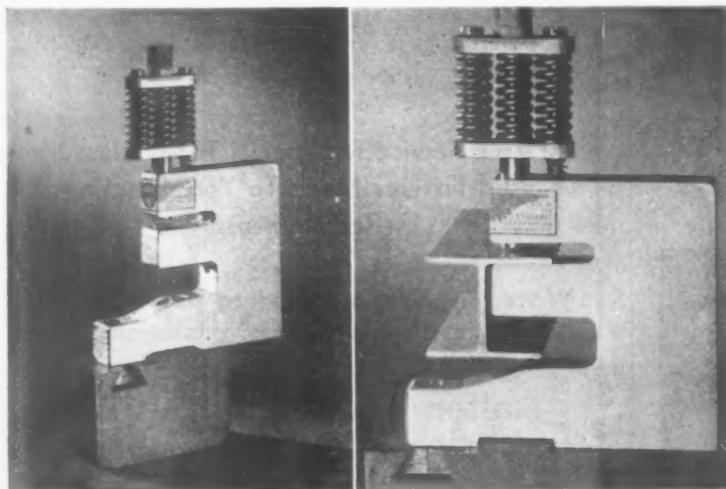
GEORGE F. WALES, President

Specialists in Punching and Notching Equipment

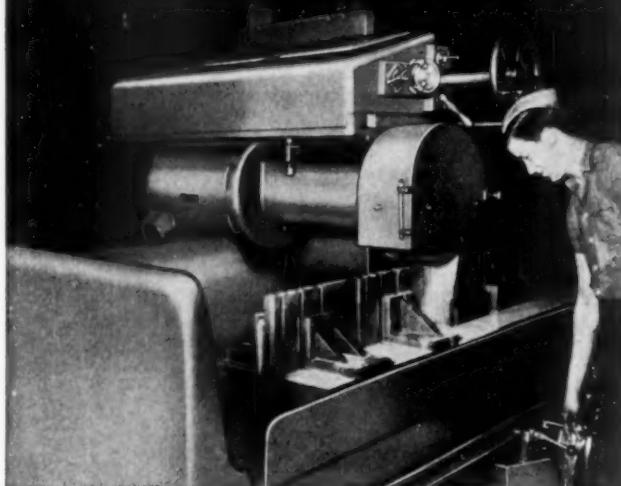
Showing a Wales Type "E" Hole Punching Unit on section of press brake rail.

Example of typical H-section being punched by Type "E" Unit.

Line-up of several Wales Units showing how 1 to over 200 can be mounted on press brake rail to punch as many holes.



PRECISION GRINDING



*"A fine degree of accuracy
is absolutely necessary"*

That is the kind of finish grinding specified by The National Acme Co. on tool slides for their Acme-Gridley multiple spindle automatics and that is the kind of ground finish achieved with their HILL "Open Side" Horizontal Spindle Hydraulic Surface Grinder. Notice that the tool slides are finish ground in "gangs", for speed and uniformity. The extremely close tolerances held by the HILL Hydraulic Grinder insures precision operation of the finished part in the complex mechanism of these automatics. An inquiry from you on your rough or finish grinding problems will receive prompt attention. No obligation, of course!

The HILL ACME Co.

6400 BREAKWATER AVE. • CLEVELAND, OHIO

HILL "Open Side" Surface Grinders are built in both Horizontal Spindle and Vertical Spindle types in a full range of sizes with table dimensions 18", 24", or 30" wide and 5 to 20 feet long.

PROMPT DELIVERY

FOR

Victory!



GALTER HIGH GRADE TOOLS



DEPENDABLE PERFORMANCE

Guaranteed

Plain Milling Cutters

Side and Face

Milling Cutters

Stagger Tooth Side

Milling Cutters

Shell End Mills

Slot Cutters

Taper Shank Cutters

Spiral End Mills

Counterbores

Countersinks

Reamers

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Taper Shank Drills

Straight Shank Drills

At Your Service for Special Tools, Dies, Jigs
And Fixtures Made To Your Exacting
Requirements

Write for prices on standard sizes or submit
blueprints for special quotations.

Galter Manufacturing Co.
711 W. Lake Street • Chicago, Ill.

MASTERS of PRECISION



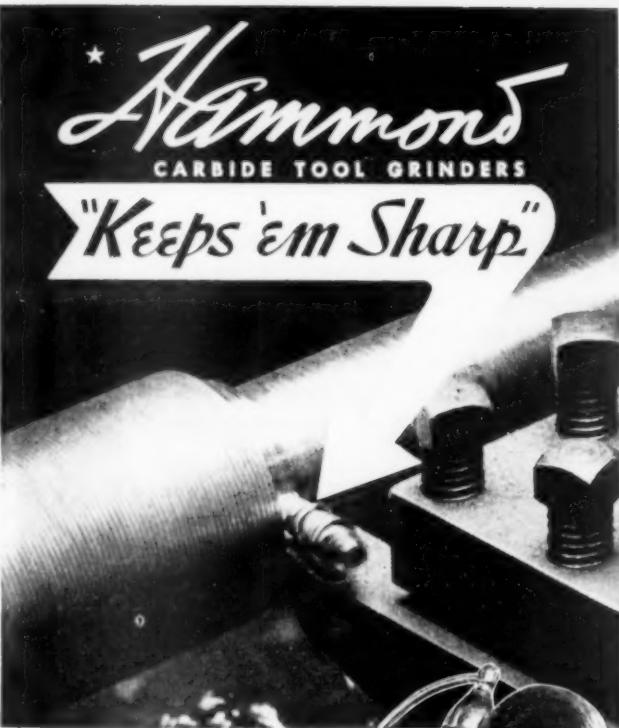
CLEEREMAN Jig Borers and the men who build them are masters of precision. Design, selection of materials, fabrication, assembly, inspections, and tests are all performed with one purpose in mind—to build precision machines that will turn out precision work at low cost for many years after purchase.

Users know that CLEEREMAN men and CLEEREMAN Jig Borers are masters of precision.

Bryant Machinery & Engineering Company
Sales Division: Cleereman Machine Tool Co.
400 W. Madison St. • Chicago, Ill., U.S.A.

Jim Le Clair—master craftsman—testing the precision of a CLEEREMAN Jig Borer spindle.

CLEEREMAN
DRILLING MACHINES and JIG BORERS



*** CHIP
BREAKER
and
CARBIDE
TOOL
GRINDERS**



**GRINDERS FOR COMPLETE CARBIDE
TOOL SHARPENING MAINTENANCE**

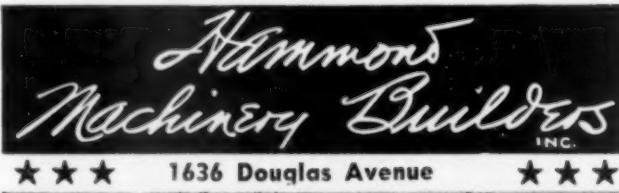
Maintaining highest efficiency in YOUR cutting tools to prolong tool-life and insure constant high production rates means one thing: Grind 'em frequently, KEEP 'EM SHARP!

Here is YOUR answer to that problem.

Hammond offers YOU many different types in its wide line of Carbide Tool Grinders for rough and finish grinding, and the grinding of chip breaker grooves into Carbide Tools. Each type is modern — with up-to-the-minute features.

Act now — write for complete information. Hammond Grinders will help you maintain that high efficiency so necessary in the speeding-up of YOUR Arms Production. "Beat that Delivery Promise" with Hammond Grinders and sharper tools.

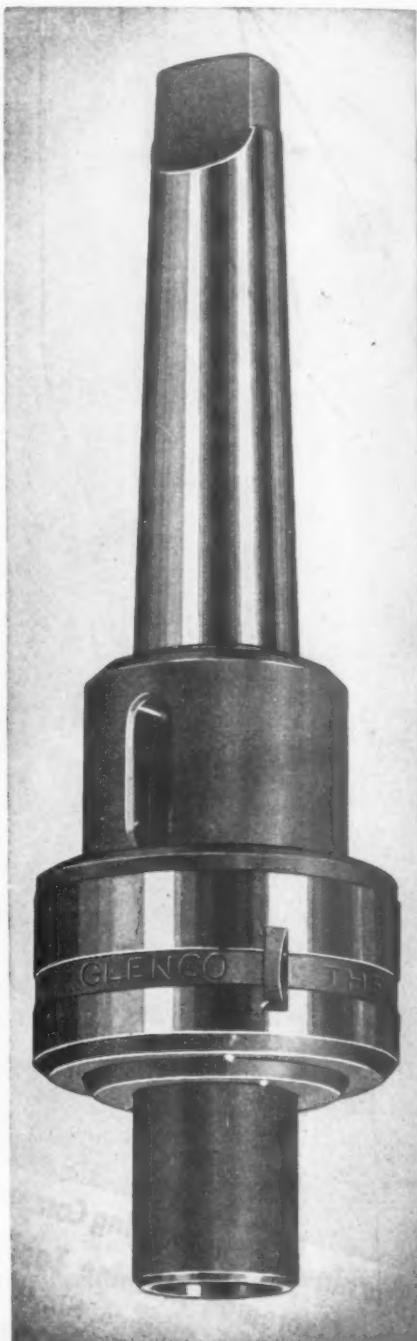
ASK FOR BULLETIN 201



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KALAMAZOO • MICHIGAN
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GLENCO FLOATING TOOLHOLDER

Corrects Machine Tool Misalignment By
Producing TRUE and ACCURATE Holes



Also Manufacturers of

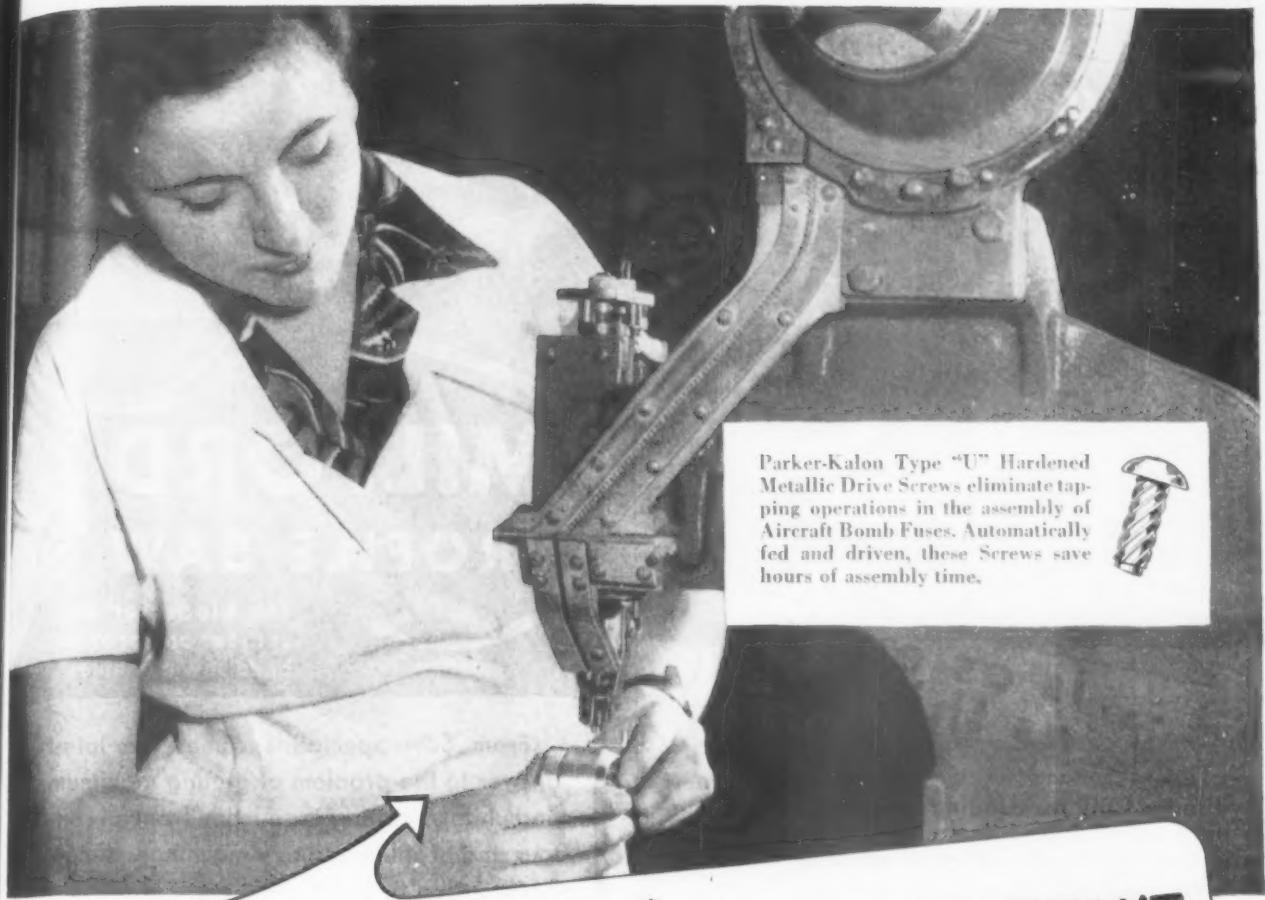
Hammond Tools

FLOATING
HOLDERS
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COUNTERSINKS

REAMERS
COUNTERBORERS
LIVE CENTERS
SLEEVES
TAP CHUCKS
DRILL CHUCKS
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ADJUSTABLE
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ASSEMBLIES
QUICK CHANGE CHUCKS
EXTENSION SOCKETS
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ARBORS
END MILLS
WOODRUFF CUTTERS
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THE J. C. GLENZER CO.
DETROIT MICHIGAN



Parker-Kalon Type "U" Hardened Metallic Drive Screws eliminate tapping operations in the assembly of Aircraft Bomb Fuses. Automatically fed and driven, these Screws save hours of assembly time.



Saving Operations ON IMPORTANT WAR ASSEMBLIES... WITH THE RIGHT TYPE OF P-K SELF-TAPPING SCREW!

No matter what you're producing for the fighting forces - bomb fuses, field kitchens, gun sights, radio transmitters, machine guns or range-finders - there's a type of Parker-Kalon Self-tapping Screw that will help you *save operations and cut assembly time!* No matter what material you're working with - plastics, die castings, sheet steel, aluminum, bronze or brass - Parker-Kalon Self-tapping Screws will give you stronger fastenings, *while eliminating costly, time-consuming tapping operations.* You'll gain valuable time, too, when you cut out the fumbling that goes with using bolts and nuts - when you put P-K Screws on the job instead of trying to rivet in hard-to-get-at-places!

Parker-Kalon's rigid control over screw quality is another time-saver to war-busy industries. Every Parker-Kalon Self-tapping Screw is guaranteed to drive easily and hold tight! "Doubtful screws" - screws that *look all right but fail to work right* have been eliminated by the Parker-Kalon Laboratory's thorough check-up routine.

Call in a Parker-Kalon Assembly Engineer to study your fastening problems - chances are that he can quickly help you find ways to speed up your assemblies with the proper use of Parker-Kalon Self-tapping Screws. Parker-Kalon Corporation, 190-198 Varick Street New York, N. Y.

PARKER-KALON *Quality-Controlled* SELF-TAPPING SCREWS

Give the Green Light • to War Assemblies



SELF-TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY . . . AND OTHER FASTENING DEVICES



• Self-contained Barnes Hydraulic Unit for Honing machine. Providing cylinder space and piping to each cylinder constitutes total hydraulic effort of machine manufacturing.

Making mechanical feed transmissions takes a lot of machining time and skilled manpower. To make gears, splines, and cams -- to mill, drill and precision bore housings for feed transmissions -- requires both skilled manpower and precision machinery.

If you are now using mechanical feed transmissions on your machinery or, if you are buying hydraulic elements (pumps, valves, etc.) from different sources you will benefit materially by designing your machines for Barnes Hydraulics. Here's how:

USE BARNES UNIT-TYPE HYDRAULIC FEED TRANSMISSIONS

The Barnes Unit-Type method of securing hydraulics for metal working machines and other mechanical structures offers one of the fastest and most efficient hydraulic design services available.

Complete circuits are designed and built from Barnes standard hydraulic elements--pumps, valves, etc. These are assembled in compact self-contained or panel units simple to install--SAVES DESIGN AND ASSEMBLY TIME, SPEEDS DELIVERY.

TWO METHODS AVAILABLE

Method 1—Barnes Self-contained Hydraulic Unit can be designed with necessary pumps and valves to complete hydraulic functions of your machine. Oil reservoir is included—providing cylinder space and connecting two pipes to each cylinder constitutes your total hydraulic effort.

Method 2—Use a Barnes Panel Unit — similar to above, except provision must be made in machine for oil reservoir and motor mounting.

FREE DATA

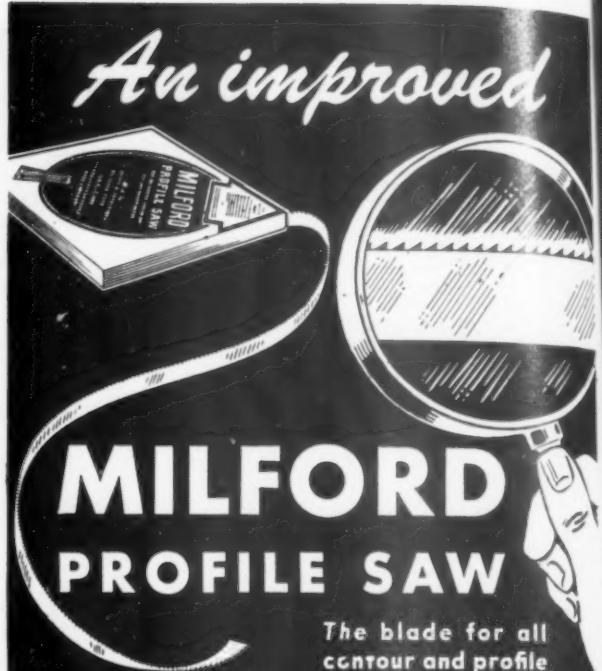
40 page booklet contains detail descriptions of all Barnes elements and typical installation circuits. Write for your copy today. Ask for Bulletin T.E. 343.



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AND FACTORY
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From Saw Specialists comes the latest answer to the problem of getting maximum and uniform cutting production from all contour and profile band saw machines. A new automatically controlled method of heat treatment of metal cutting saw guarantees the uniform depth of hardness of every foot of PROFILE SAW. Uniform depth is tested by "etching" sample pieces of each saw ... the surest, oldest method known to metallurgy.

Research in our own shops never stops ... even under the pressure of War Production, and the accurate control of the depth of hardness of each tooth is but one of several new developments.

MILFORD PROFILE SAW is made and guaranteed by its originators and the world's largest producer of metal cutting band saw blades.

Order from your mill supply distributor

Perhaps you have not yet adapted your band saw machines to Profile Sawing. In that case be sure to write us for directions giving description of cutting jobs and machines.

THE HENRY G. THOMPSON & SON COMPANY

NEW HAVEN, CONNECTICUT

Also makers of MILFORD REZISTOR HACKSAW BLADES

Today her shears are Unishears



YESTERDAY her materials were gingham and taffeta.

After John joined his regiment, she wanted to help, too. A nearby airplane factory offered opportunity to help build fighting ships to protect John.

Today, her shears are Stanley Unishears . . . those clever metal cutting shears that follow the most intricate pattern in sheet metal. Fast, careful cutting takes on a new significance when she reads the combat record of the planes she helps to build.

Hundreds of thousands of others like her are helping to win the war of production. We are proud to be able to furnish the electric tools which in the skilled hands of women and men are speeding the day when all can return to their peaceful pursuits. Stanley Electric Tool Division, The Stanley Works, New Britain, Connecticut.

1843

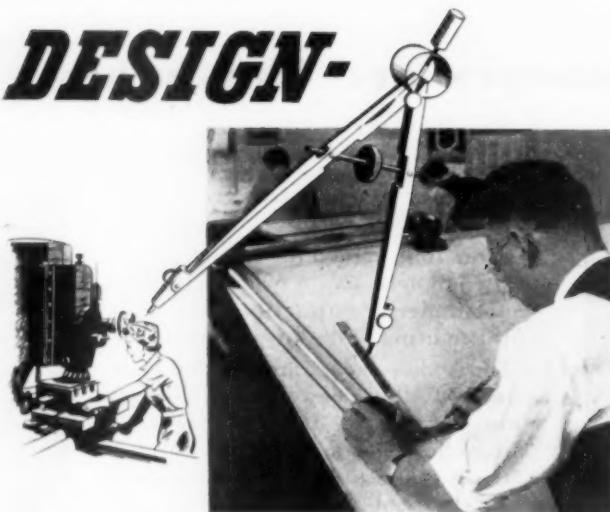
STANLEY

1943

TRADE MARK



DESIGN-



... for

EFFICIENT MANUFACTURE

In these days of dependable machines and highly developed shop technique, *design* is the all-important factor in every job. Skillful design means fast, economical production.

More than thirty-five years of "know how" have given the McKinney organization the skill and experience to solve your design problems. And because we are tool builders as well as designers and engineers, we have a *practical* approach to your requirements.

Let McKinney help you with those "tough" tooling problems on your war production program. We invite your inquiries.

DEPEND UPON MCKINNEY FOR:

- ★ Design and manufacture of dies, jigs, fixtures
- ★ Process Engineering
- ★ Tool Designing
- ★ Plant Layout and Routing
- ★ Product Engineering
- ★ Machine Designing

MCKINNEY

TOOL & MANUFACTURING CO.

1688 ARABELLA RD. CLEVELAND, OHIO

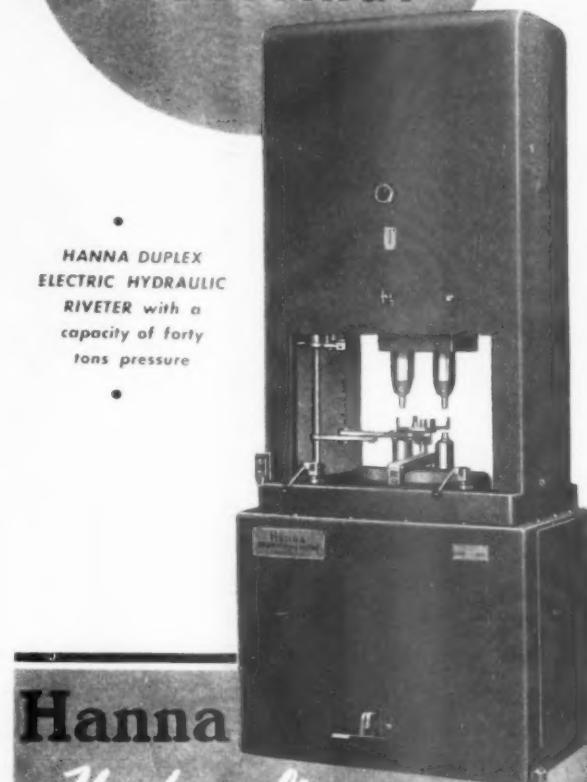
"DESIGN ENGINEERS



FOR TWENTY YEARS"

Want to
INCREASE PRODUCTION
in RIVETING and
UPSETTING?

HANNA DUPLEX
ELECTRIC HYDRAULIC
RIVETER with a
capacity of forty
tons pressure



Hanna
Hydraulic
RIVETING PRESSES

BUILT for action that gets things done, Hanna Riveting Presses will drive from one to six—or more if wanted—rivets in a single stroke. Rivet die advances rapidly at low pressure until contact—then pressure increases as the rivet is driven, giving a positive set. Die reversal occurs the instant the rivet is driven—rapidly. It's all automatic with uniform results.

When your production riveting or upsetting operations demand action, put Hanna Riveting Presses to work. Their capacities range from 10 to 100 tons.

Write for full details and tell us about your problems.

HANNA ENGINEERING WORKS
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RIVETERS • CYLINDERS • AIR HOISTS

THE TOOL ENGINEER

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date . . .

THREE FREE SERVICES

without obligation

For your convenience these three business reply cards enable you to request quickly

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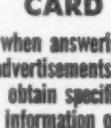
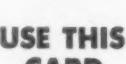
for requesting new catalogs and bulletins listed in this issue.

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for requesting additional information or bulletins about new equipment, materials, processes, etc.

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NEW EQUIPMENT, Materials, Processing

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MACHINES FOR TANK PRODUCERS

Making use of their 26-HO hydraulic feed machine, Baker Brothers, Inc., of Toledo, Ohio, have recently constructed machines which perform various operations in holes in tank turret index rings.

Of the three types of machines furnished, one was for drilling and countersinking 40 holes on a 78.750 inch circle. Here two Baker hydraulic feed machines with multiple heads were mounted on special bases around a power automatic index-table.

Another type was a single unit machine, also using the 26-HO hydraulic feed machine on a special base with the special work table carrier. This machine, shown in the accompanying illustration, was furnished for counterboring 48 holes in the ring.

The third machine was furnished for multiple drilling and countersinking and tapping 48 holes in the ring which mates with the main turret ring. This machine also handled 48 holes in the main turret ring.

These machines are said to be entirely automatic in cycle, it only being necessary for the operator to chuck rings



Baker Hydraulic Feed Machine
Set-up for producers of tanks.

from proper locating points and clamp. The machine is manually started by the operator and then continues automatically in cycle until all operations have been performed.

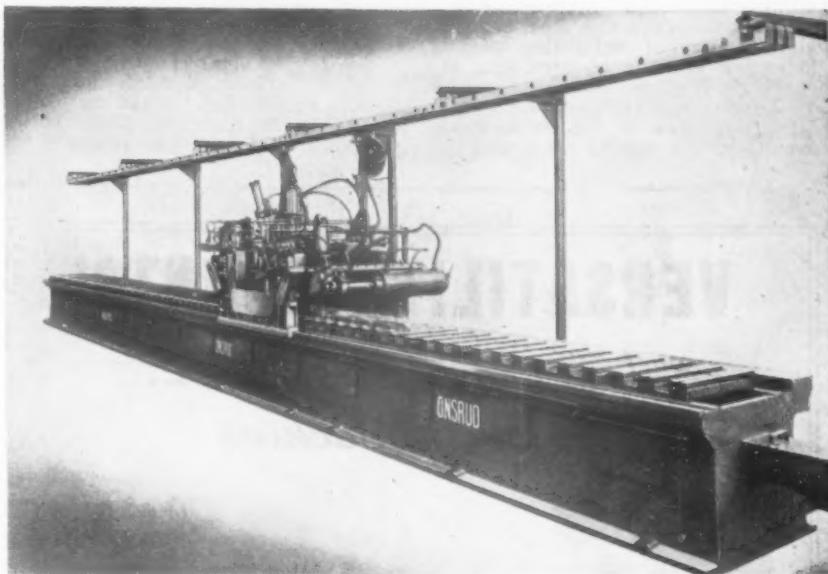
The power automatic index table is said to be flexible so that it can be indexed for different spaced holes. The machine is designed, however, with the table in a fixed position, allowing for drilling only on the required bolt circles.

AUTOMATIC CONTOUR MILLING MACHINE

A new kind of milling machine, said to save time and labor on the machining of non-ferrous material in sizes too large for handling by the average milling machine, has recently been developed by the Onsrud Machine Works, Inc., Chicago.

The bed of this machine, on which

(196)



Automatic Contour Milling Machine Announced by Onsrud Machine Works
Four cutter heads make possible four separate cutting operations.

the carriage rides, consists of one or more cast iron sections which come in 7½ and 15 foot lengths. Any combination of these sections may be bolted together to secure as long a bed as necessary. Bolted to the ground surface of the bed are 20 inch table sections of open grate type construction. The table is provided with T slots on 9 inch centers. Table is 24½ inches wide. The maximum diameter for horizontal cutters is 9 inches and for vertical cutters 3 inches. The maximum clearance of work is 7 inches high and 20 inches wide.

The speed of carriage travel can be varied from 4 inches to 18½ feet per minute. The carriage rides along the stationary work table on main bearing surfaces at the rear of the bed.

The machine is equipped with four cutter heads. There are two vertical cutters and two horizontal cutters which are said to make it possible to perform up to four separate cutting operations on one piece of material in one pass of the carriage.

Cutter travel is guided by means of templates which are made to the shape of the finished work.

tion to meet the accuracy demanded in sheet-metal stampings and various other types of tool work.

The manufacturer estimates that die life can be increased from 25 to 100 percent by relocating and finish-grinding the holes after hardening. This is claimed because the finish is smoother and



The New Moore Jig Grinder
Eliminates checking time.

JIG GRINDER

A new jig grinder was recently announced by the Moore Special Tool Company of Bridgeport, Conn. It is said to have been developed for the finish-grinding of holes to size and loca-

(197)

NEW EQUIPMENT

the decarbonized surface of the steel is removed. A more uniform clearance between the punch and the die is said to result.

This machine is said to eliminate time in checking and measuring on the bench and surface plate. Previous to the development of this machine for example, the manufacturer states that holes in a multiple-station die would have to be ground one section at a time, including all of the steps of centralizing, locating, indicating, grinding, re-assembling, and checking. With the Moore jig grinder, all the sections are screwed and doweled into place, put on the machine and ground in one setting, depending en-

tirely on the jig grinder for location.

The machine has a capacity to grind holes from .030 inch to 4 inches, accuracy of screws of .00005 inch per inch, and grinding speeds of 15,000, 25,000, and 45,000 rpm.

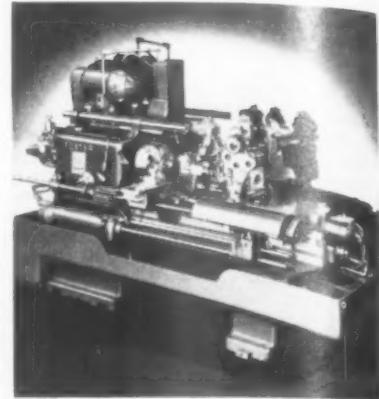
NEW FOSTER TURRET LATHES

(J99)

Featuring a machining cycle that is entirely automatic, the new turret lathes recently announced by the International Machine Tool Corporation, Foster Division, Elkhart, Indiana, are known as the No. 1-F and the No. 2-F.

With the machining cycle entirely automatic, the operator concerns him-

self only with loading and unloading the work and thus, the manufacturer claims, conservation of man power is accomplished because one operator can attend to several of these machines,

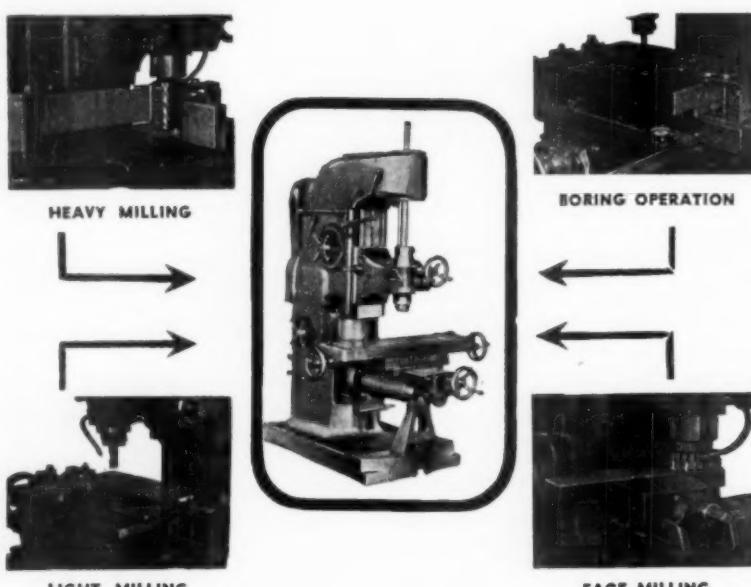


New Foster Turret Lathe
Has flexible feed system.

These machines are equipped with a flexible hydraulic feed system which provides an independent feed for each face of the turret. For this reason, it is said that no time is lost in changing over from one cut to another. On many occasions the same tools may remain in the turret and simply reset for the particular work in hand. Provided with the lathes are standard cams which are adjustable to control the various movements or change the operating speed.

A hydraulic cylinder mounted beneath the cross slide at the rear of the machine provides a method for operating facing heads mounted on the hexagon turret.

The 1-F lathe has a range of 27 spindle speeds from 22 to 332 rpm arranged in nine sets of three automatic changes. The manufacturer also states that the 2-F machine has a range of 28 spindle speeds from 17 to 263 rpm arranged in seven sets of four automatic changes and that higher speed ranges may be supplied when required.



THE KNIGHT MILLER

The Knight Miller is versatile because it does light and heavy milling, facing, and boring—and is accurate to the thousandths in every operation! Furthermore, the need of costly fixtures, special angle plates, and angle cutters is eliminated through the use of the swivel and tilting table features. Write today for complete information.

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 3920 WEST PINE
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36 Years A Builder of Quality Milling Machines

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

UNIVERSAL CHECK VALVE

(J100)

Said to be designed primarily for installation in airplane hydraulic lines, the new type universal check valve now in production at American Screw Products of Los Angeles allows twelve combinations to be made with one body and any two of three types of adapters.

This valve, called the "ASP", is claimed by the manufacturer to be 16 percent lighter and to have a two to four times increase in flow capacity with corresponding reduction in back pressure.

Made in all standard tubing sizes of heat treated aluminum alloy, a standard body can be assembled, it is said, with two of three types of adapters to meet the requirements of any combination of tubing or pipe connectors or

(Continued on page 168)

THE TOOL ENGINEER

WAR-TIME SHOP RECIPES

for thread production



GROUND TAPS, THREAD GAGES,
THREAD HOBs & SPECIAL THREADING
TOOLS. SPECIAL TAPPING MACHINES



MARCH, 1943



RECIPES — 140 pages of them — to help you get more accurate threads in production — with better taps, thread gages, thread milling cutters.

If your shop is producing threaded parts, you too should have one of these Shop Recipe books: the new "DETROIT" loose-leaf Catalog No. 22.

Write on your company letterhead.

DETROIT TAP & TOOL CO.
8432 BUTLER STREET, DETROIT, MICHIGAN, U.S.A.

NEW EQUIPMENT

direction of fluid flow. A phenolic poppet seats at either end of the valve body and adapters are available for flared tubing or external and internal pipe threads.

It is claimed that this valve is unaffected by vibration, variable pressures, or acceleration, and that it provides positive protection in critical lines.

TWO SPINDLE MILLING MACHINE

A special two spindle, high speed milling machine for milling gun synchronizer pads on an aircraft engine rear crankcase was recently constructed by Davis & Thompson Company of Mil-

INFORMATION FREE

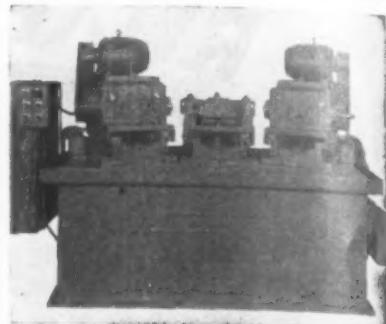
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 143.

waukee, Wisconsin.

The two heads are mounted on each side of a fixture carrying slide, all of which are set on ways and moved between positive stops by individual hydraulic cylinders. Functioning through a predetermined cycle arrangement, the machine fixture moves from the loading position to a fixed position and the

cutter heads feed in on an angle in relation to the work. The heads and the fixture are automatically returned to the loading position after the feed stroke is completed.

The machine cycle is operated through a combination of electrical and hydraulic control units. The base of the



Two Spindle Milling Machine Mills gun synchronizer pads.

machine carries the hydraulic pump and oil reservoir. Adjustments for the hydraulic feed control are mounted on the end of the machine. Electrical controls are grouped together in a panel and connected to a push button box.

Also included in the machine is an integral coolant pump and an attached motorized centrifugal pump for supplying cutting compound to the cutter heads.

DRILLING UNITS

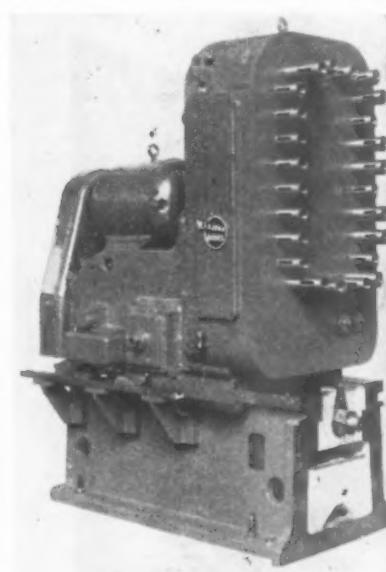
Select the most efficient
COOLANT PUMP
for that
Rebuilt Machine

Don't Waste Horsepower or Materials

Be sure it can deliver the maximum capacity for your requirements without compelling you to accept excessive horsepower to satisfy those requirements.

Pioneer Pumps provide maximum capacity with low horsepower; they conform to the order of the day by conserving vital metals and energy—and consequently release the extra horsepower and materials for other war production.

There is a Pioneer Pump to meet your exact requirements, for there are over 300 stock models available. We'll gladly help you select the right one for your particular needs.



Tank Turret Drilling Units Have multi-spindle heads.

of Rockford, Illinois for the drilling of the 360 degree revolving turret on the M-4 Medium Tank.

There are two different units, one with 24 spindles and the other with 25 spindles. The accompanying illustration shows the 25 spindle standard hydraulically-actuated unit. The spindles on the 24 spindle head are arranged with
(Continued on page 170)

PIONEER PUMP AND MANUFACTURING COMPANY

19645 JOHN R STREET • DETROIT, MICHIGAN

for checking —

Besides the two models illustrated—there are many other "HY-MAC" test units for various purposes in the field of aircraft. Here is a brief description of a few others:

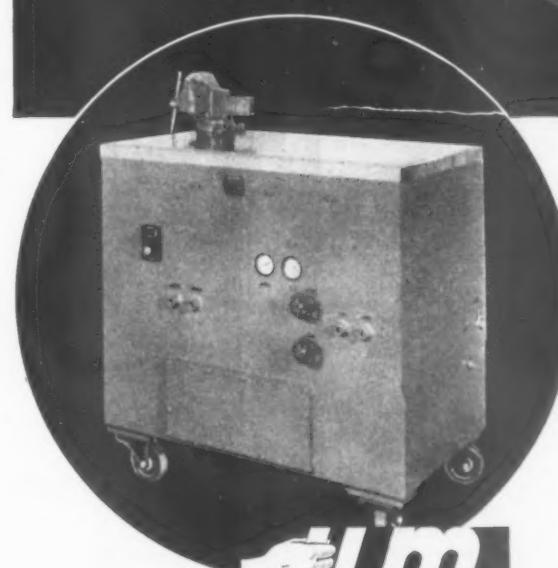
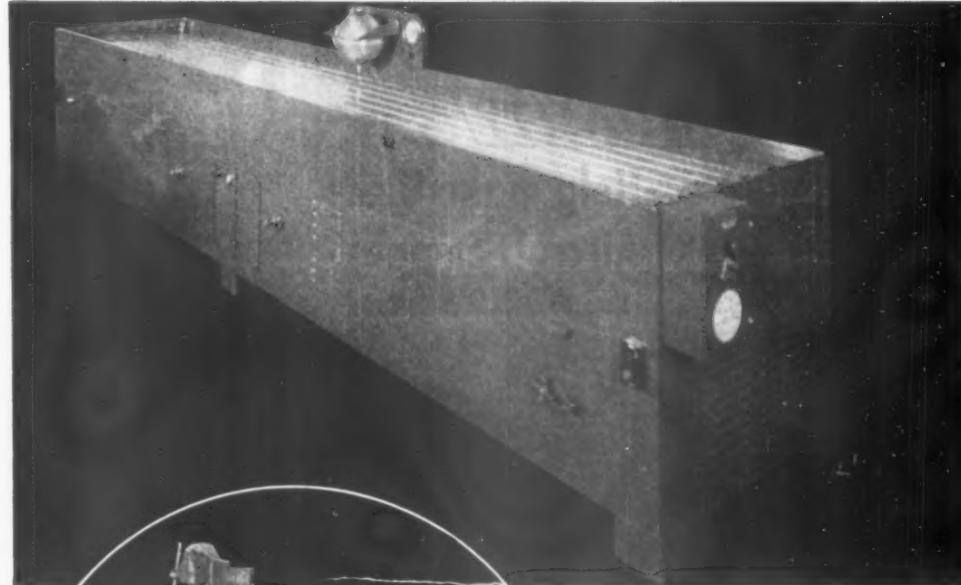
T-103 Stationary Hydraulic High Pressure Tube Tester—primarily designed for testing flexible tubing but also used for checking short sections of plain metal tubing . . . as many sections as required may be tested at a time . . . the Hydraulic Pump is capable of a 1000 lb. per square inch pressure that may be built up to a 10,000 lb. per square inch pressure by means of a built-in intensifier.

T-104 Water Pressure Test for Aircraft Cylinder Heads. . . Heads are clamped into position on a trunnion that may be rotated for inspection. It is operated by a Hydraulic power plant capable of producing 1000 lb. per square inch, which is supplemented by a high pressure hand pump or intensifiers to accomplish whatever pressure is required. All of the mechanism is enclosed.

Send for complete information regarding "HY-MAC" HYDRAULIC TEST EQUIPMENT.

HYDRAULIC MACHINERY, INC.
12825 FORD ROAD • DEARBORN, MICH.

HYDRAULICS BEFORE & AFTER ASSEMBLY



T-102 Principally used for checking aircraft tubing this stationary Hydraulic Test Bench with a variable test pressure ranging from 0 up to 10,000 lbs. per square inch and a variable delivery pumping unit 0-12 gal. per minute—is used to test anything in the line of hydraulic equipment before its assembly into aircraft.

T-101 Portable Hydraulic Test Bench is used for pre-flight checking of the hydraulic circuits of planes—for checking all of the hydraulic functions without running the airplane engines. It may also be equipped with a gasoline engine driven pump for field testing.



HYDRAULIC MACHINERY

18 spindles equally spaced about a circle and 6 spindles in a cluster.

Both heads are equipped with anti-friction bearings, hardened alloy steel gears, and heat-treated spindles and shafts according to the manufacturer.

DUPLEX SPLINE AND KEYWAY MILL

(K3)

The Giern & Anholt Tool Company of Detroit has recently introduced a duplex spline and keyway mill which is said to mill keyways on very long pieces in one setting.

It is provided with two mill heads which are located 180 degrees from each other and are fed by ratchet feed to-

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wards one another simultaneously at rates up to 0.020 per stroke. The machine also has an automatic cut-out setable for the depth of cut.

The machine has two tables. One is the feed table which has a travel of 12 inches and the other is the setable table which is adjustable for location of work

and is locked securely in place in bolts after setting.

The spindle speeds, which vary from a low of 230 rpm to a high of 600 rpm, are said by the manufacturer to meet the demand for cutters ranging from 3/16 to 1 inch diameter. The table feed is



Duplex Spline and Keyway Mill
The machine has two tables.

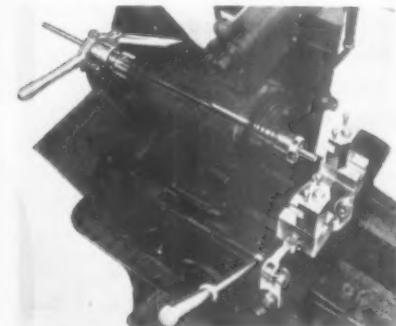
hydraulic constant flow vane type pump system.

One model of the machine is built for a 50 inch length and the other one for 96 inches. The diametrical capacity is 10 inches.

NEW CROSS SLIDE AND COLLET CLOSER ATTACHMENTS

(K4)

Two new accessories have been announced by the Kessler Aero Products Corporation, 211 West Palm Avenue, Burbank, California. The first is a quick-acting collet closing attachment which is said to handle accurate duplicate work



New Attachments Used With Lathe
Collet closer and a cross slide.

on bar and tubing stock from 1/32 inch up to and including 1/2 inch diameter by chucking and releasing work while the lathe is running. The manufacturer claims that this saves 75 percent production time in this particular operation.

The second attachment is a lever-type cross slide which is used in conjunction with the collet closer and provides for forming and fast cut-off. It is said that both accessories may be easily assembled without machine work or interference with the normal operation of the lathe.

Claimed to convert small and medium size engine lathes into the speed range of hand production screw machines, these two attachments are

(Continued on page 172)

THE TOOL ENGINEER



**Help make U.S.
Aircraft Engines
the WORLD'S finest**

STURTEVANT
**TORQUE
WRENCHES**

Protect...

STURTEVANT TORQUE WRENCHES protect the performance and life of most U.S. Aircraft engines—not only travel with them in the tool boxes but are used to control the torques applied in their manufacture.

They are used to assure the uniform "set" on vital screws that prevents uneven strains and warping, to gauge the set of spark plugs, to measure frictional drag, etc. Coming in sizes to accurately measure torque from 0 to 7200 inch pounds, they eliminate guesswork and haphazard tightening. They are introducing new accuracy in the manufacture of even the most delicate instruments . . . are provided in husky giant sizes for the heaviest work.

Products of STURTEVANT, pioneer designers and manufacturers of accurate torque wrenches, they have the patented flat beam which eliminates all springs, adjustments and fragile mechanisms or moving parts. They are permanently accurate and have double dials that can be read from all working angles.

**NO
FRICTION
ADJUSTMENTS
MOVING PARTS
FRAGILE
MECHANISMS**

**CAPACITIES
from
0 to 7200
inch pounds**

**PA Sturtevant Co.
ADDISON QUALITY ILLINOIS**



SUPER CARBIDE-TIPPED SPECIAL TOOLS

*speed equipment
to all fronts of the
GLOBAL WAR!*

Illustrated here are only a few of the many carbide-tipped tools of special design which we have manufactured to meet the requirements of virtually every type of plant devoted to war work . . . from the makers of small airplane parts to the builders of huge tanks.

See Our Exhibit at the 1943
Machine & Tool Progress Exhibition
MILWAUKEE, MARCH 25-27, BOOTH 53-54

SUPER TOOL CO.

21650 Hoover Road
Detroit, Michigan

Carbide Tipped Tools

FOR TURNING • FACING • REAMING • SPOTFACING • BROACHING
FORMING • GRINDER RESTS • WEAR PARTS • BORING • MILLING • DRILLING
GROOVING • COUNTERBORING • SHAVING • CENTERS • SPECIAL PURPOSES

—NEW EQUIPMENT—

recommended for a number of makes of lathes of $\frac{3}{4}$ inch spindle capacity.

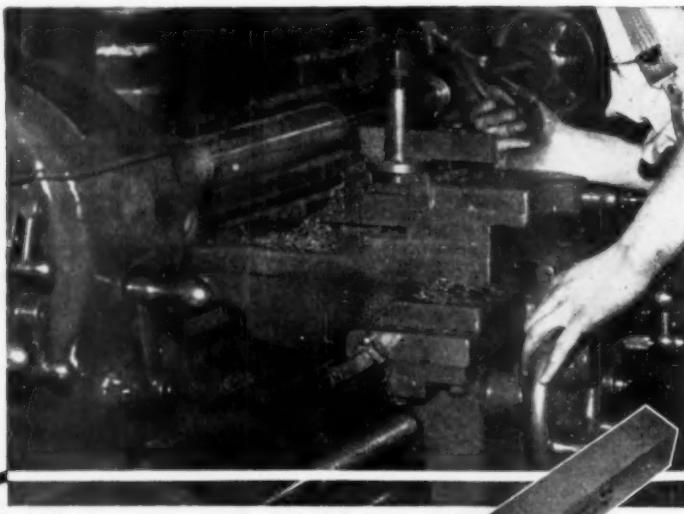
SURFACE GRINDERS

Surface grinders in both horizontal spindle and vertical spindle designs are being manufactured by The Hill Acme Company of Cleveland, Ohio. The machines include such features as a reciprocating table drive that is 100 percent hydraulic and operates on low pressure with variable table speeds of from 10 to 100 feet per minute; a main drive motor that is built integral with a dynamically balanced spindle and a rapid traverse that is provided for raising and

(K5)



Surface Grinders in Both Horizontal and Vertical Spindle Designs
Reciprocating table drive, speeds from 10 to 100 feet per minute.



KENNAMETAL^{*} *Supports Production Schedules*

STYLE II

New methods and types of equipment have permitted the attainment of production volume previously thought impossible for the metal machining industry. KENNAMETAL, however, was produced with capabilities which met the demands of a stepped-up manufacturing system. It provided the steel cutting industry with a tool that will operate at extremely high speeds...that slices through metal even under the demands made by severe interrupted cuts, irregular surfaces, and high Brinell steels.

There is a KENNAMETAL tool that will increase production on your particular job. Use this superior cutting tool for boring, turning, and facing steels in your plant.

Write for your copy of the KENNAMETAL Tool Manual which gives complete information about these tools.

*INVENTED AND MANUFACTURED IN U. S. A.



lowering the wheelhead with hand controls for final adjustments.

Said to be ideal for special purpose grinding and production operations, the manufacturer also states that these grinders may be used as a general utility tool to produce a superior finish on flat or irregular surfaces.

The grinder illustrated is of the "Open Side" type. Standard table sizes are 18, 24, and 30 inches wide and 5 to 20 feet long. On the vertical spindle grinder provision has been made according to the manufacturer, for tilting the head so as to grind concaves within the maximum periphery of a 26 inch segmental grinding wheel.

The cross feed on the horizontal type is also said to be 100 percent hydraulic and can be set for a constant feed or adjusted for jump feed at each reversal of the table. The spindle head can be manually operated or locked in place for form or contour grinding.

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NEW ROTARY TABLE

(K6)

A new 6 inch rotary table, said to be small enough to get into usually inaccessible places, was recently announced by the Duro Manufacturing Company of 800 East 61st Street, Los Angeles.



New 6 Inch Rotary Table
Fast rotation a feature.

One feature claimed by the manufacturer of the new table is fast rotation which is made possible by the 60 to 1 ratio of the worm gear. Giving a 6 degree rotation for one turn of the crank, this ratio is said to be versatile for tool making, layout, inspection and production.

(Continued on page 174)

THE TOOL ENGINEER

To the Skeptic who hasn't yet tried the **POR-OS-WAY WHEEL**



THREE MEN in the armed forces want all you can give them—NOW! You may, as hundreds of war plants have already proved, increase your precision grinding production 2 to 5 times per man per machine with the Por-os-way wheel. Try it!

A YEAR AGO we introduced to industry a new precision grinding wheel. We were confident, after three years' research and scores of actual trials on production work that this new wheel, Por-os-way, would produce 2 to 5 times more work per man per machine. And we said so. At first there were few believers. Our statement seemed incredible. But there was a war to be won. War plants by the score tried Por-os-way, probably with more hope than conviction. They did not fully realize, then, that Por-os-way, being an entirely new kind of wheel, could not be limited by comparison with wheels they had been using.

But skepticism is disappearing. Many operators now know that Por-os-way's patented honeycombed structure cools each grinding point between contacts, practically eliminating "burns" in vital war work. Many know that they can double or treble the depth of former cuts and grind in fewer passes of the wheel . . . have seen how the Por-os-way wheel holds its corner and resists "loading", reducing the number of dressings necessary. Many have proved to their own satisfaction that the life of a Por-os-way wheel is at least equal to or better than previous wheels, and know that Por-os-way can produce 2 to 5 times more work per man per machine. But even among Por-os-way's most enthusiastic users, some few are still not pushing Por-os-way to the limit of its possibilities. We want you to give this wheel "the whole works." We want you to see for yourself it is all others say it is. Send for "Facts about Por-os-way", with a "prescription blank" for a trial, run to your requirements.

**2 TO 5 TIMES
MORE WAR PRODUCTION
PER MAN PER MACHINE**

War plants say, "Tell others what Por-os-way has done for us."

WAR PLANT A—Job: Surfacing oil-hardened, high-speed steel blanks on B & S grinder at 6200 S.F.P.M.

Results: Por-os-way removed .050" in one pass, against .020" previously. Por-os-way wheel lasted 2½ times as long as former wheel, required no dressing, produced no burn, held shape and corner while grinding.

WAR PLANT B—Job: Grinding high-speed cutter tool steel on LeBlond No. 1 at 4750 R.P.M.

Results: Por-os-way increased production 300%. Held a true edge in grind-

ing a complete gear cutter. No burning, no loading. Free, cool cutting without dressing. Good finish.

WAR PLANT C—Job: Internal wet grinding on Bryant 16-A machine at 8946 R.P.M. on hardened tool steel—SAE 41/50. Precision grinding.

Results: Obtained 400% better production. Cut fast, free, and cool. Diamond dressed only occasionally to retain shape.

POR-OS-WAY*
a new
RADIAC® PRODUCT

A. P. DE SANNO & SON, INC.

NEW YORK, CHICAGO, PITTSBURGH,
CLEVELAND, DETROIT, LOS ANGELES



PHOENIXVILLE, PENNA.

Western Gateway to
VALLEY FORGE



*T. M. Reg. U. S. Pat. Off.

COPYRIGHT, 1943, A. P. de Sanno & Son, Inc.

NEW EQUIPMENT

INFORMATION FREE

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The beveled dial, accurately cut and graduated to tenths of a degree, is said to assure easy reading. Back lash has been eliminated by an eccentric adjustment between the worm and the gear.

Two "T" slots cross at 90 degrees and a "T" lock screw is provided for fixing the position of the table. The

center hole of the table is $\frac{5}{8}$ inch in diameter. All moving parts are said to be easily lubricated.

Constructed of seasoned semi-steel, the table has a height of $2\frac{1}{8}$ inches and a net weight of $14\frac{1}{2}$ pounds.

MARKING TOOL

(K7)

One outstanding advantage of the new marking tool recently announced by Jas. H. Matthews and Company of Pittsburgh is that it is an interchangeable steel type holder and can be used for hand stamping or in a press for production marking.

For hand stamping applications, the

removable head is placed over the shank. It is held in place by a set screw which is tightened at the side. For press use, the head is removed and the shank is placed into press equipment. The accompanying illustration shows the marking tool and the removable head.

The manufacturer recommends this holder for 90% of all heavy or medium



New Matthews Marking Tool
Steel holder Interchangeable.

marking applications which require long, continuous hard usage. This holder can be made for any desired type capacity.

For light duty marking of wood, brass, and other soft materials, the manufacturer recommends a character size up to $\frac{1}{2}$ inch. For medium duty marking of such materials as cold rolled steel and carbon steel, up to $\frac{3}{8}$ inch character size is recommended. For medium heavy duty marking of carbon steel or high alloy tool steel, $\frac{3}{16}$ inch characters are used.

The steel type is said to be easily and quickly changed in the holder by applying slight pressure on a spiral spring which disengages the spring clip from the type groove.

AUTOMATIC CENTERING MACHINE

(K8)

A 2-spindle automatic centering machine for bars up to 6 feet long has recently been announced by Pines Engineering Company of Aurora, Illinois. On this machine, one chuck and one head are stationary while the other chuck and head are movable for adjustment to accommodate different lengths of bars.

One chuck is removed from the machine to center pieces from 18 inches long down to 6 inches long. Chucks are both actuated by air cylinders directly connected through a rack and pinion on the screw for opening and closing the jaws. A cam on the lay shaft for advancing the two spindles actuates a four-way, solenoid operated air valve through a limit switch closing the chucks automatically.

To align the chuck jaws with the

(Continued on page 176)

Certain territories are still open for sales representatives. Correspondence solicited.



PAT. PEND.

3,000 R. P. M. --- 80" FEED P. M.

The above 8" Spar Mill, and chips, are actual size, without retouching. The cutter was designed in accordance with the requirements of Douglas Aircraft engineers, who report:

"SATISFACTORY BEYOND EXPECTATIONS."

A casual glance at the smooth, scroll chips, confirms the report.

ONROVIA
CALIFORNIA

Grayson Manufacturing Company

ALCOTT BLDG.
ROCKFORD, ILL.

NEW EQUIPMENT

spindles to compensate for wear, adjustments are provided. A maximum of 5 inch diameter round bars is the capacity of the chucks. In the accompanying photograph, the regularly provided guard has been removed to show the rack actuating mechanism for the chuck.

NEW HYDRAULIC HAND PRESS

The new high speed straightening press manufactured by Anderson Bros. Mfg. Co., 1907 Kishwaukee Street, Rockford, Ill., is operated by a hand hydraulic pump and is said to have a capacity up to 20,000 pounds. The manufacturer states that the design of this

(K9)

INFORMATION FREE

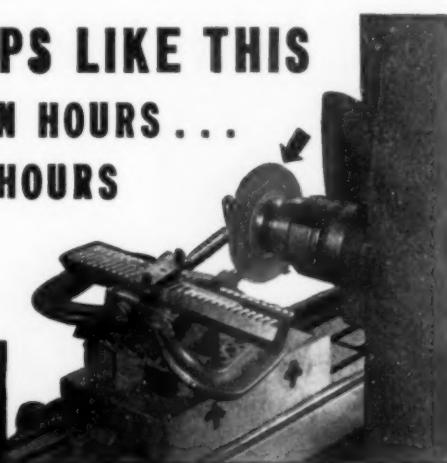
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

press eliminates moving shaft from anvils to centers for checking.

Checking and bending are done in the same position. When the pressure is released, the spring tension on the rolls brings the shaft free of the anvils and free to rotate for checking.

Equipped with an indicator gauge for

GRINDING SET-UPS LIKE THIS Mean LOST MAN HOURS . . . LOST MACHINE HOURS



**You Can Be Sure of
FULL PRODUCTIVE
GRINDING TIME
When You Use
The MAGNA-SINE**

The angular grinding set-up on the Magna-Sine, as shown directly above, was completed in one-twelfth the time required for that shown at upper right. It eliminates the need for V-blocks, angle plates, sine bars, clamps and strap.

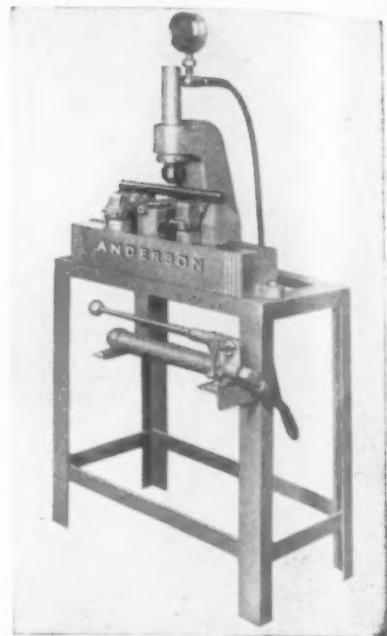
In addition to reducing set-up time to an absolute minimum, the Magna-Sine's precision construction makes possible the most

accurate angular grinding work. Every angle is held to the same accuracy as the standard gage blocks which are used.

Magna-Sines are supplied in two sizes in both compound, and single angle models. Non-Magnetic models are also available for inspection purposes.

Write for full details.

ROBBINS ENGINEERING COMPANY
318 MIDLAND AVENUE • DETROIT, MICHIGAN



New Hydraulic Hand Press
Has 20,000 pound capacity.

locating high and low spots on the shaft the press has a pressure gauge by which the operator determines the tonnage required to straighten the shaft. This machine is said to handle work up to 1½ inches in diameter. Larger sizes are planned by the manufacturer.

UNIVERSAL OPTICAL COMPARATOR

(K10)

Said to feature an exceedingly large working capacity which makes it possible to handle parts heretofore considered beyond the range of optical inspection apparatus, this universal optical comparator is manufactured by the Portman Machine Tool Company, 17 and 19 Beechwood Avenue, Mount Ver-



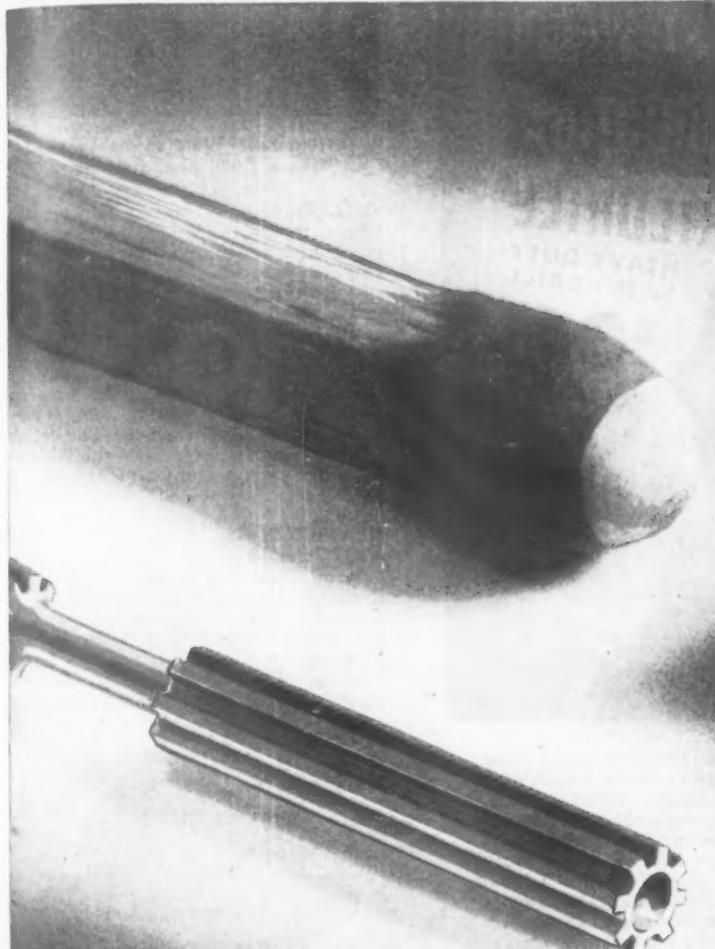
Universal Optical Comparator
Has large working capacity.

non, New York and is called the Model P-3.

The universal type stage, as seen in the accompanying illustration, is said to enable the operator to place the work (Continued on page 178)



DWARFED BY A MATCH!



A low-flying plane, aiming itself at an enemy cruiser—a lever pulled and a long, sleek torpedo drops into the water and rushes destruction toward the enemy.

But all must be right with the big tin fish!—the motor running smoothly and the fuse already for the smash into the side of the ship. Tiny mechanisms, more accurately made than any watch part, assure the success of the attack.

VINCO accuracy in the manufacture of fixed limit checking devices, is well known throughout the long list of war producers. For example, the gage at the left has proven accuracy of less than .0001 error, yet is smaller than a match stick. Parts checked with gages as accurately made as this, must operate smoothly and surely.

From a weight of an ounce to a weight of many pounds, VINCO gages all have the same VINCO accuracy.

If you have a gaging problem, VINCO can help you.

VINCO
Precision tools & gages

V I N C O
C O R P O R A T I O N
8857 SCHAFFER HIGHWAY
DETROIT • • MICHIGAN

NEW EQUIPMENT

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

in various positions. The stage travel measurement control devices permit readings to .0001 inch over the entire range.

The manufacturer states that it is possible to project large images clearly because of the wide field of the objective lens units used and the superior

light obtained with the microphotographic bulb.

Mechanical specifications include: Distance between centers of 12½ inches; vertical measuring range of 8 inches; horizontal measuring range of 8 inches; and angular setting of stage to 22 degrees.

WELDING POSITIONER

(K11)

The new hydraulic elevating welding positioner, manufactured by the Lyon-Raymond Corporation, 1121 Madison Street, Greene, N. Y., has a hydraulic tilting and elevating table which is powered by a motor driven hydraulic pump.

It is said to revolve in any position mechanically by worm gear arrangement.

Among the features and specifications of this positioner listed by the manufacturer is a 2,000 pound capacity, 30 inch diameter round table, and "T"



**Hydraulic Welding Positioner
Has a 2,000 pound capacity.**

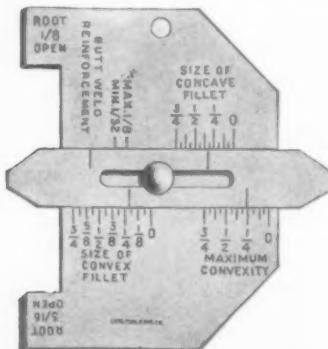
slots for $\frac{5}{8}$ inch bolts. The elevated height to the top of the table when in horizontal position is 40 inches while the height to the top of the table when it is lowered is 28 inches.

The table tilts 90 degrees from horizontal to vertical and may be revolved by a hand crank 360 degrees in any position. The table is said to be easily removed so that welding fixtures can be attached to the same top plate to which the table is attached. The accompanying illustration shows the table removed with a fixture attached to hold the piece to be welded.

NEW WELDER'S MICROMETER

(K12)

A new welding gauge which is said to enable the welder to meet exact specifications of butt and fillet type welds is now being offered by Chicago Tool & Engineering Co., 8391 South Chicago Avenue, Chicago. The manufacturer states that the gauge is handy and easy



**A New Welding Micrometer
Checks butt and fillet welds.**

to operate and that it is pocket size, measuring $2\frac{1}{2}$ by 3 inches.

It is said that welders can now accurately check the sizes of convex or concave fillets as well as check the permissible tolerance of butt weld reinforcements. The instrument is built of chromium plated steel with dimensional readings clearly indicated.

(Continued on page 180)

HERE'S AMERICA'S NEWEST WEAPON IN THE BATTLE OF PRODUCTION!

NEW!

MODEL
"47" SKILDRILL
HEAVY DUTY
1/4 IN. DRILL
\$36



Here's the tool you need for fastest, most accurate $\frac{1}{4}$ in. drilling in constant 3-shift production. Like the famous Model "45" SKILDRILL, it's small, compact, light for easiest handling—but it has even greater power for toughest jobs . . . greater drilling speed under load for more output per man!

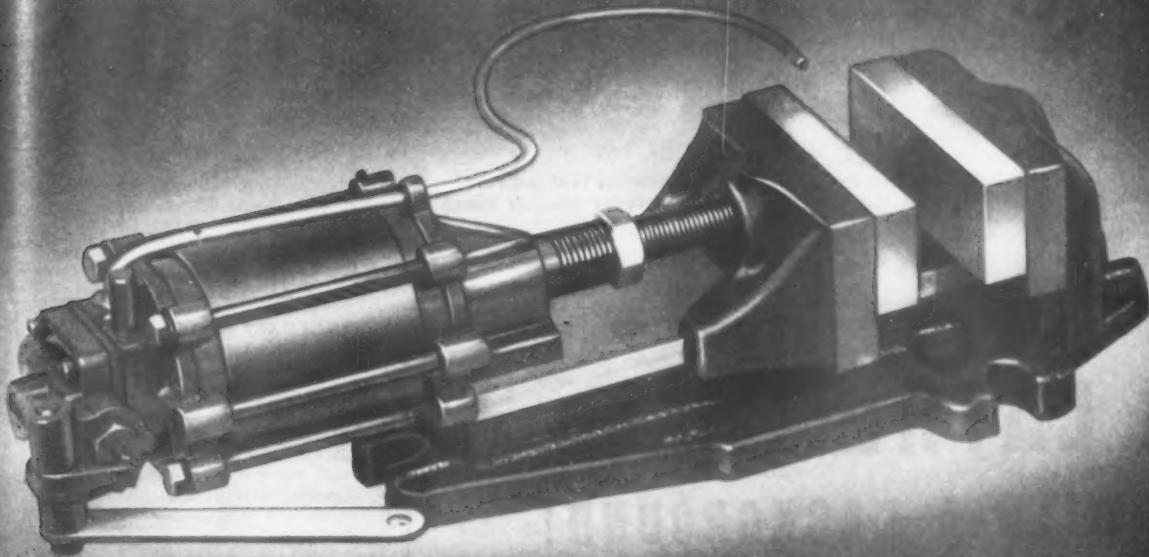
Compact die-cast body, helical-cut gears and 100% anti-friction bearing construction assure smoother, easier operation. Extra-powerful Universal Motor provides peak drilling speed up to $\frac{1}{4}$ in. in steel, $\frac{1}{2}$ in. in wood. Available in 4 speeds (1800, 2500, 3500 and 5000 R.P.M.). Weighs only $3\frac{1}{2}$ lbs.; only $7\frac{1}{4}$ in. long and $2\frac{1}{4}$ in. wide. Ask your distributor to demonstrate how NEW Model "47" SKILDRILL will boost your production!

SKILSAW, INC., 5051 Elston Ave., Chicago
New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans
Dallas • Los Angeles • Oakland • Portland • Seattle • Toronto, Canada

SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

THIS Senacon AIR-VISE SYNCHRONIZES WITH THE MACHINE TOOL CYCLE!



Saves Time . . . Cuts Waste Motion . . . Speeds Production

Here is vise operation SIMPLIFIED!

The SENACON Air-Vise is a fully automatic unit capable of complete synchronization with the main machine tool operating cycle. It provides smooth, rapid fire machining of workpieces in such varied operations as drilling, reaming, tapping, milling, sawing, filing, etc. It reduces operator movements by eliminating waste motion and time required for operating hand vises, and greatly increases the number of parts processed per unit of time.

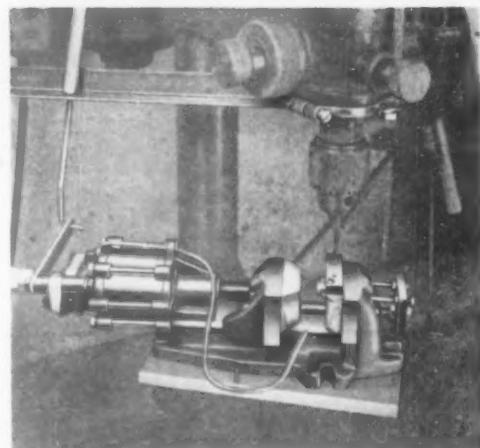
FULLY CONTROLLABLE PRODUCTION TOOL

The SENACON Air-Vise is operated by an Air Motor incorporating a universal non-operating lever and dual-exhaust control valve. Opening and closing of vise jaws is automatically synchronized with the normal machine tool cycle by simple drag link connection between the valve lever and any convenient moving element of the main machine tool. This lever is adjustable to operate from any angle in any plane. Selective use of the dual-exhaust air streams from the motor provides for blowing dirt and chips from

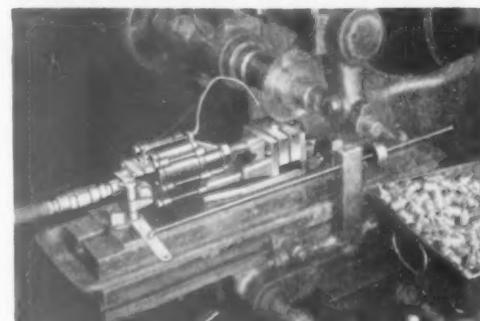
the work area, ejecting workpieces, operating feed hoppers, etc.

Specifications of this compact, sturdily constructed SENACON Air-Vise include: Two False Jaws, $5\frac{1}{8}'' \times 1\frac{1}{2}'' \times 4''$; maximum Jaw opening, $2\frac{1}{4}''$; total thrust, 500 lbs. at 100 lbs. air pressure. This is only one of many SENACON

Controlled Air-Power Devices that increase the efficiency of BOTH the machine tool and its operator. Write today for Bulletin 101, which tells how you can produce more, for less, with SENACON Controlled Air-Power.



DRILLING



MILLING Note the simple drag link connection between valve lever and main machine tool element in the above installations, and use of exhaust air blast to clear work area of chips.

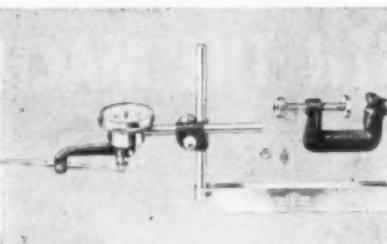
SMITH - JOHNSON CORPORATION
BENDIX BUILDING LOS ANGELES, CALIF.

EEED PRODUCTION WITH CONTROLLED AIR-POWE

UNIVERSAL TEST INDICATOR

An universal test indicator, called the 22A and manufactured by the B. C. Ames Company of Waltham, Mass., is said to be small and compact and easy to set up and adjust. Internal surfaces and places hard to get at are said to be reached with the use of a hole attachment.

The complete set, as shown in the accompanying illustration, includes an Ames 101H indicator, 3 contact points of different lengths, indicator holding rod, hole attachment, tool post holder, upright spindle, sliding swivel, and C clamp. The complete set comes in a



New Universal Test Indicator
Internal surfaces easy to reach.

wooden case.

The dial indicator that is used with

the universal test indicator operates with a crown gear to give right angle spindle motion. The bevel is held to the case with a wire and is said to be easy to remove and provides a smooth turning motion. The manufacturer states that the dial requires no spring beneath it and the internal movement is assembled to a thick brass plate with large diameter screws. All staffs are hardened, ground, and polished.

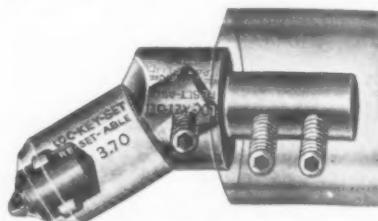
INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

ANGLE SET TOOL FOR DIAMOND DRESSERS

(K14)

A new 30 degree Angle-Set attachment for dressing 2 inch radius from template with 3 to 4 karat common quality diamonds, recently announced by Diamond Tool Company of Chicago, is said to permit improved finish and speedier production.



Angle Set Tool for Dressers
Permits rotation of nib.

An important feature claimed by the manufacturer is that this new tool permits rotation of nib to re-sharpen the diamond. This 30 degree side angle lock set holder enables centerless grinders (with template attachment for the centerless grinding of bullet noses) to use common quality diamonds to form wheels by dressing from 1 to 6 inch radius with the Angle-Set.

The mean fixed position left or right in which the diamond nib is held is said to prevent wear to the setting in this dressing operation and eliminates the use of thin diamonds and weak points for dressing.

THE END.

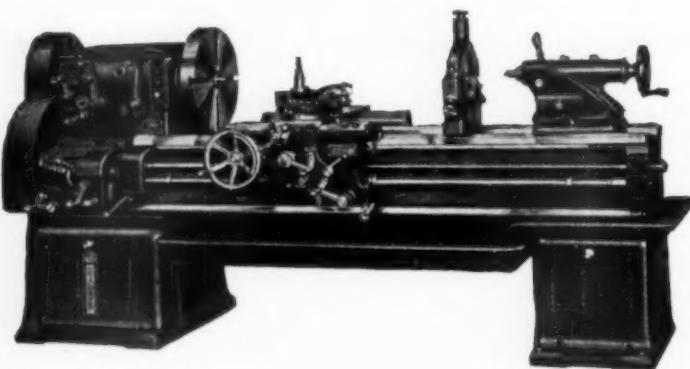
NEW LITERATURE
More New Literature on page 184**(677) Speed Reducers**

Janette Speed Reducers. 100 pp. Janette Manufacturing Company, Chicago, Ill. A complete index is included with this new catalog which illustrates, describes, and prices the speed reducers manufactured by this concern. Applications, specifications, and dimensions are given on both the motorized and motorless speed reducers.

(678) Tapping Machine

Bakewell Tapping Machine No. 1. 12 pp. Bakewell Manufacturing Company, 2023 Sante Fe Avenue, Los Angeles, Cal. Illustrations show the various models of tapping machines manufactured by this concern plus their parts and accessories.

A LATHE WITH A BACKGROUND!



MACHINERY BUILDING BEHIND OVER 100 YEARS OF METAL WORKING

BRADFORD'S *Metalmaster*

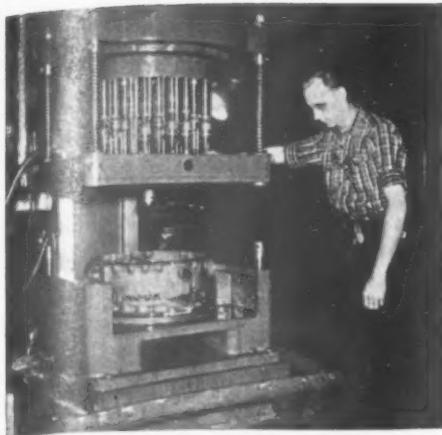
There is no guess-work with war work. The job must be completed quickly and accurately. This Bradford lathe will give you top production. The Metalmaster is the latest achievement of more than a century of experience in the building of metal working machinery. The illustration shows the 14" by 8' model geared head lathe. Send for literature which gives complete information and specifications on this production-minded lathe.

ALSO MANUFACTURERS OF DRILLING AND TAPPING EQUIPMENT

THE BRADFORD MACHINE TOOL CO.
EVANS STREET SOUTH OF EIGHTH, CINCINNATI, OHIO
PRECISION TOOLS SINCE 1840

some tips

ON MODERATE AND HIGH-PRODUCTION DRILLING



(Above) **BARNESDRIL** Vertical H-4 Hydram with 74 Spindle Auxiliary Head drilling 74 holes simultaneously in supercharger rear housing cover.



FREE DATA: Write today for data covering complete line of **BARNESDRIL** equipment. Ask for Bulletin T.

In selecting drilling equipment, the required production is the determining factor. Here is some information on multiple-spindle drilling that can be of help in selecting your new drilling equipment.

MULTIPLE-SPINDLE DRILLING MACHINES

Where production warrants, and where the spacing of holes to be drilled permits gears and spindles of sufficient strength, drilling all holes with one pass of the head achieves highest production. The machine shown at the left for drilling 74 holes simultaneously is of standard design with the exception of the fixture and tooling.

INTERCHANGEABLE MULTIPLE-SPINDLE HEADS

Where production is moderate it is often advantageous to use several

different drill heads on one machine. One of the parts drilled on the machine shown at the lower left had 66 holes. These were so closely spaced it was necessary to use a 22-spindle head and index the fixture twice.

USE STANDARD BASIC MACHINES WHEN POSSIBLE

Special production drilling problems can best be solved with standard, basic machines. Delivery is faster and your capital investment kept at a minimum. These are but two of many applications of our Hydram Hydraulic Drilling Machines being used on "special" production work. Perhaps one of our basic machine designs can be used on your drilling job. Our engineers will be glad to assist you in determining the correct model and tooling—no obligation.

848-871 CHESTNUT ST.
Barnes Drill Co. ROCKFORD, ILLINOIS, U.S.A.



AN ALL-ELECTRIC ADJUSTABLE-SPEED DRIVE for A-C. CIRCUITS

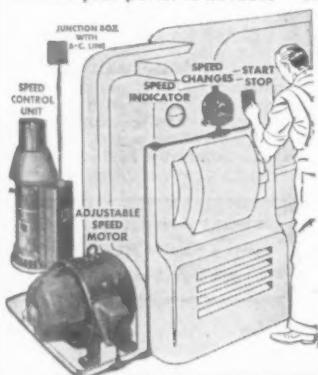
Speed Ranges up to 16 to 1
Sizes — 1 to 30 hp.

1. DIRECT DRIVE. You need fewer parts (no intermediate speed-adjusting device) and less space. Streamline your machine design. Get your power closer to where your power is needed.

2. SPEED CONTROL CONVENIENCE WITHOUT LIMITATIONS. Start-stop button and speed-changer go at any handy point to which you can run a wire. . . . Control is within easy reach.

3. FROM A. C. POWER SUPPLY. You enjoy many advantages at a new low price due to the "packaged" V&S Speed Control Unit. Mount it anywhere. Connect it by three wires to a 3-phase a-c. circuit.

Other Production Aids follow: Quick stopping, reversing, speed-setting, safe speeds for threading, ample starting torque with smooth acceleration.



Reliance Bulletin No. 310 will give you the details

RELIANCE ELECTRIC & ENGINEERING CO.

1088 IVANHOE ROAD • CLEVELAND, OHIO

Sales Offices in Principal Cities



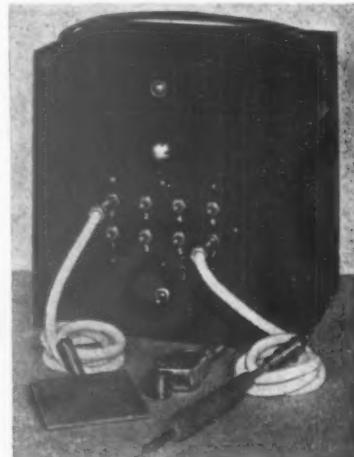
Mark Iron,
Steel and
Carbides

the

Etchograph

Way

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MORE THAN
3000 IN USE



NEW MODEL

Buy the Original Electric Etcher

Three sizes to meet all requirements. Also a combined Etchograph and Demagnetizer.

WITH NEW ELKONITE TIP PENCIL

Mark hardened parts, tools, dies, gages and fixtures of any ferrous metals including the hardest alloys and carbides — quickly — plainly.

Write for circulars and prices.

BREWSTER-SQUIRES COMPANY

54 Church Street

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U. S. A.

What is a MICRO-CHEK?

The Trico Micro-Chek is a new type of comparator gage, used on inspection lines, or at machines, which speeds up the gaging of precision parts. It visually multiplies dimensions by 200. Its big, highly visible indicator greatly reduces eyestrain and fatigue. Its simplicity enables inexperienced workers quickly to become accurate inspectors. Our booklet tells more about its many applications.

WHO USES IT?

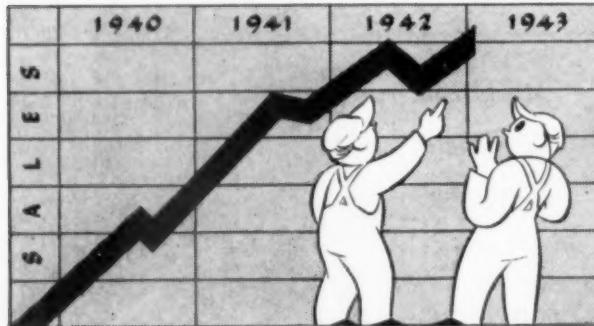
INSTRUMENT SIZE
6" x 2 $\frac{1}{2}$ "

MICRO-CHEK
with base plate only . . . \$9.75
Adjustable Anvil . . . \$3.00
Other type Anvils available.

Send for FREE Micro-Chek booklet. Address:

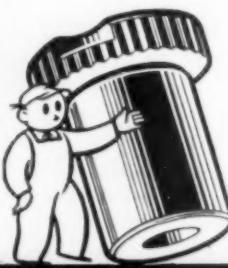
TRICO PRODUCTS CORP.
Dept. T, Buffalo, N.Y.

More than 1500 war plants and government arsenals—many of which time and again have reordered additional scores of Micro-Cheks.



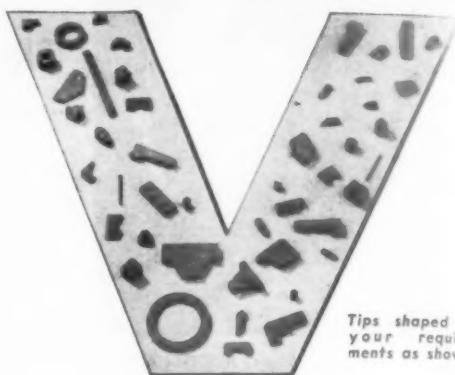
UNIVERSAL GROWS BY LEAPS AND BOUNDS

Production of Universal Drill Bushings has doubled each year over the same preceding period for the last three years—proof that American manufacturers demand the best. Universal bushings have superfinished bores which assure accuracy and unexcelled wearing qualities. Write for complete facts.



UNIVERSAL ENGINEERING CO.
FRANKENMUTH • MICHIGAN

WILLEY'S METAL



Tungsten Carbide blanks as illustrated are manufactured exclusively under WILLEY'S Patents in grades suitable for all your machining requirements.

Whether you are machining tough steel, cast-iron malleables or aluminum, etc., there is a grade of WILLEY'S METAL that meets your needs for maximum efficiency. Specify WILLEY'S METAL and follow the VICTORY SIGN.

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WILLEY'S CARBIDE TOOL CO.
1340 W. Vernor Highway, Detroit, Michigan



TUTHILL
MODEL L
SMALL INDUSTRIAL PUMPS

**SAVE SPACE
SAVE MATERIAL
SAVE TIME
SAVE MAINTENANCE
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ideal for coolant, lubrication, hydraulic mechanisms, fuel oil and liquid transfer service.

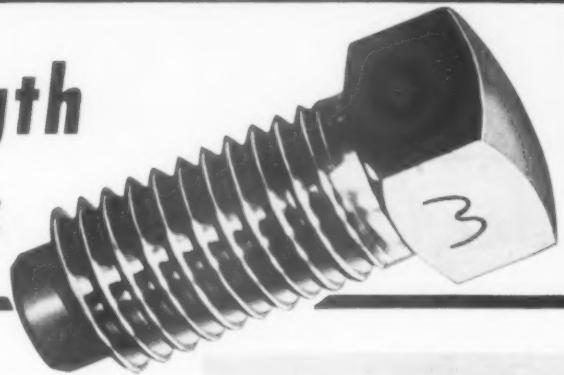
These positive-displacement, internal-gear rotary pumps are available in capacities from .33 to 3 g.p.m. and pressures up to 400 p.s.i. Ring or foot mounted. Mechanically sealed.

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These Screws Have a Place in Your Plant

Where tremendous gripping power is necessary and projecting heads present no hazard, there is no substi-

tute for just plain strength. Broken screws, upset points and fatigue failure can be avoided by specifying stronger screws.

Mac-its

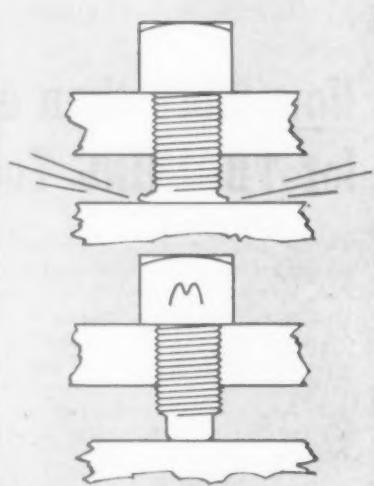
PRONOUNCED
"MACK-IT"

OTHER MAC-IT PRODUCTS INCLUDE:

Hexagon Socket Cap Screws • Hexagon Head Cap Screws • Hollow Set Screws • Hollow Pipe Plugs • Stripper Bolts

Mac-it Square Head Set Screws are heat-treated for maximum torsional strength and to resist upsetting of the points. A $\frac{5}{8}$ " Mac-it, for example, has a gripping power of more than 25 tons!

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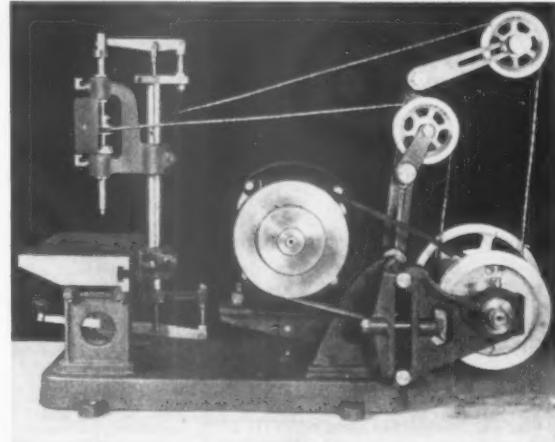
PRECISION PRODUCTION at 23,000 R.P.M.

with the *Super Sensitive*

L & D HIGH SPEED DRILL PRESS

The L & D High Speed Drill Press is a precision production tool for work requiring drilled holes from .004" to 1/16" in diameter. Extreme sensitivity is obtained by balancing the spindle by means of the vertical component of the belt tension. This transmits the "feel" of even the tiniest drills directly to the finger-tip control. The precision spindle is perfectly balanced so that absolute accuracy is maintained over long life, and drill breakage is kept at a minimum.

Eight speeds from 3,000 to 23,000 R.P.M. are standard. Machines



with one, two, three or four spindles are available to suit the precision requirements in all phases of watch and instrument manufacture.

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BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — L & D HIGH SPEED DRILL PRESSES

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NEW LITERATURE *

OF INTEREST TO PRODUCTION EXECUTIVES

*TM REG. U.S. PAT. OFF.

(653) Plastic

"Lucite" for Aircraft, 110 pp. E. I. du Pont de Nemours & Company, Arlington, N. J. In this new manual, methods of fabricating "Lucite" methyl methacrylate resin into airplane enclosures and other products are described in detail. Information is given on the sawing,

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shaping, cementing, finishing, and repairing of the plastic. Besides pictures and diagrams illustrating these operations, there is a listing of the material's properties.

(654) Industrial Training

An Effective Means of Training War Workers Faster, 8 pp. National Audio-Visual Council, Incorporated, 140 N LaSalle St., Chicago. This pamphlet explains how Visual Learning Guides supplement U. S. Office of Education Training Films, speeds training and provides a source of accurate information for further study or reference after the pictures have been shown. There is a list of the 48 subjects covered by the guides and prices.

(655) Electric Drills

The Portable Electric Drill, 20 pp. Black & Decker Manufacturing Company, Towson, Md. This new handbook is designed to show new workers the correct methods of using portable electric drills so as to obtain greatest efficiency and longest life. Besides telling how to use the drill, the booklet also covers such points as assembling the drill, switch control, drill chucks and bits, and proper maintenance.

(656) Welders

Welding Booklet, 12 pp. Westinghouse Electric and Manufacturing Company, E. Pittsburgh. This new pamphlet compares advantages of A-C to D-C welders, illustrating a complete line of Flexarc A-C Welders with current ratings from 100 to 500 amperes. Featured are the 500 amp industrial welder and the 300 amp portable welder, both of which have built-in power-factor correction.

(657) Lubrication equipment

Alemite Industrial Lubrication Equipment, 50 pp. Alemite Division, Stewart-Warner Corporation, 1826 Diversey Parkway, Chicago. This catalog describes stationary and portable power guns, lubricant loaders and transfer pumps and all types of manually operating greasing equipment. The equipment is charted in accordance with the kind of lubricants pumped, container capacity, operating power and pressure. A comprehensive selection guide adds to the book's handiness.

(658) Turret Milling Machine

Universal Turret Milling Machine, 10 pp. Aircraft Machinery Corporation, Burbank, Cal. This folder tells what the Armor Universal Turret Milling Machine is capable of doing, both in production milling and in tool and experimental milling. The hydraulic feed system is clearly explained and accessories and Model 4-H specifications are included. The folder is also well supplied with photographs.

(659) Tubing and Pipe

Tubing and Pipe Protection Methods
(Continued on page 186)

Now more than ever you need this help for TRAINING Tool and Die Makers

Widely used by many companies and trade schools throughout the U. S., it meets urgent need for a complete, up-to-date text for training new men, "refreshing" older men, or trouble shooting in the tool room. The shortage of tool and die makers must be met fast by men who know the "whys" and "hows." This book gives them both and more. It shows how to select tool steel; how to make tools; how to avoid trouble; how to improve tool performance. Read below what others say about this modern text.

TOOL STEEL SIMPLIFIED

By FRANK R. PALMER
Vice-President of
The Carpenter Steel Company

315 pages — 205 illustrations

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Read What Others Say:

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Supervisor Industrial
Education
State of Wisconsin

... Simple and easy to read. Contains useful information which commends it to technical men, semi-technical men, and men in the shops who want to improve their ability to make the best use of tools. Prof. Bradley Stoughton

Dept. of Metallurgical
Engineering
Lehigh University

J. B. Chalmers
Director of Training
The Yale & Towne
Mfg. Co.

... have read and re-read the book. Became absorbed in finding out and learning so many things I never knew before. Chapter 17 on quenching is worth the price of the book... will need 45 copies for classroom use.

F. E. Laverty
Worcester Boys' Trade
School
Worcester, Mass.

The Carpenter Steel Company
Reading, Pa. Dept. 4M

Please send me postpaid your convenient handbook, "Tool Steel Simplified". I enclose \$1.00 (\$3.50 outside the U. S. A.) in full payment.

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Now**

SAY! YOU, UP THERE on the PRODUCTION FRONTS--

No more holding up the steady flow of vital war needs because you're waiting for grinding wheels.

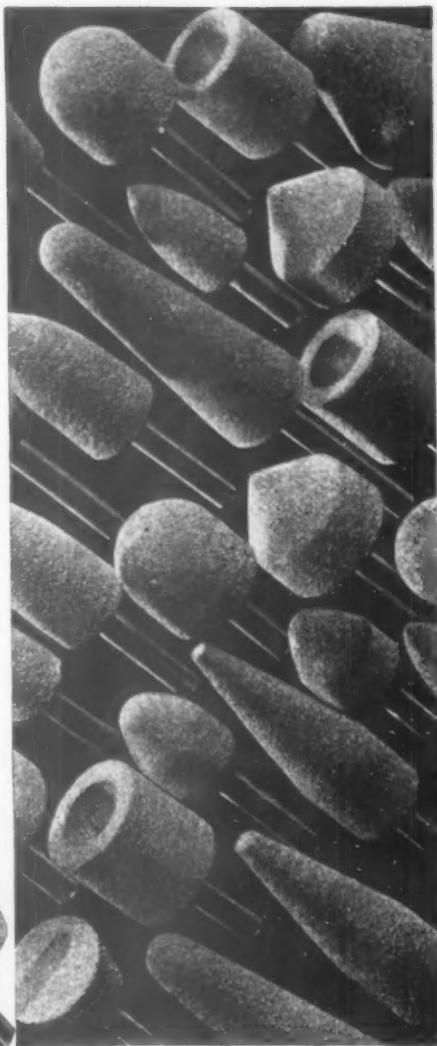
WE'RE RIGHT BEHIND YOU

Can make prompt deliveries on all Mounted Points and Grinding Wheels 3" in diameter and under. We've stopped making the larger sizes for the duration, so we can fill orders quickly for these important smaller sizes.

TRY ONE FREE — Tell us the kind of job, type grinder you use and size wheel you'd like for your test, and we'll send one free postpaid.

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IT'S OUR WARTIME JOB

With the approval and endorsement of WPB, all our facilities are concentrated on turning out large quantities of wheels 3" in diameter and under. We're at it 24 hours a day, and keeping up with orders. Our central location is an advantage and means no time is lost between our production line and yours.

NEW CATALOG — shows mounted wheels in actual colors and sizes, portable electric tools and time-saving accessories for grinding, burring and polishing.

MAIL THIS COUPON TODAY

Send Catalog Free Wheel. Size ..

TE-3

Name ..

Address ..

NEW LITERATURE

10 pp. Tubing Seal-Cap, Incorporated, 215 W. Seventh St., Los Angeles. Reasons why Seal-Caps and Seal-Plugs are said to be the most effective method of protecting and sealing tubing, threaded fittings and hydraulic units are contained in this new booklet. A few of the uses of tubing Seal-Caps in an aircraft plant are described and illustrated.

(660) Aircraft Tools

Production Tools for the Aircraft Industry. 42 pp. Aero Tool Company, 231 W. Olive St., Burbank, Cal. This is the 1943 catalog of cupforged, compact parameter inspected, microglass polished precision aircraft tools developed by

the Aero Tool Company in cooperation with leading aircraft manufacturers. There are large photographs of each tool with information as to the tool's application, features, construction and materials, sizes, ordering instructions and prices.

(661) Steel

Max-el Machinery Steels. 12 pp. Crucible Steel Company of America, 405 Lexington Ave., New York. Latest of the Max-el Machinery Steel folders contains handy data and stock information on Max-el 1-B, 2-B, 3, 3½ and 4 steels. The identification, composition, machinability, tensile values, and other

pertinent facts about each steel are given.

(662) Thermometer

Industrial Recording Control Thermometer. 8 pp. Wheelco Instruments Company, Harrison and Peoria Sts., Chicago. This new bulletin discusses the "electronic principle" of effecting temperature control without mechanical contact between measuring and control sections of the instrument. Also described are program and proportioning thermometers and combinations of thermometer's with Flame-otrol, a combustion safeguard instrument.

(663) Mechanical Power Transmission

War Time Manual of Mechanical Power Transmission. 388 pp. Dodge Manufacturing Corporation, Mishawaka, Ind. Complete descriptions, diagrams, dimensions, and prices of thousands of power transmission appliances are contained in this No. 42 manual. In addition, over 100 pages are devoted to engineering data essential to proper design, installation, and operation of mechanical power drives. Attention is given to products which may be used as alternates for those difficult to obtain. There is a section on belt conveyors.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(664) Drilling and Boring Machine

W. F. & John Barnes 445 Deep Hole Drilling and Boring Machine. 4 pp. W. F. & John Barnes Company, Rockford, Ill. This new folder includes 10 different illustrations of this machine and completely describes the various features. Specifications are listed and line drawings of deep hole tooling set-ups in pack bit boring and drilling—two-lipped drill are included.

(665) Machine Tools

Greenlee at War. 28 pp. Greenlee Bros. & Company, Rockford, Ill. Full of illustrations, this new booklet shows what this concern is doing in the way of machine tool building for the war. Photographs show men at work in the various parts of the plant. Other pictures show some of the machines built by this company in actual use at war plants.

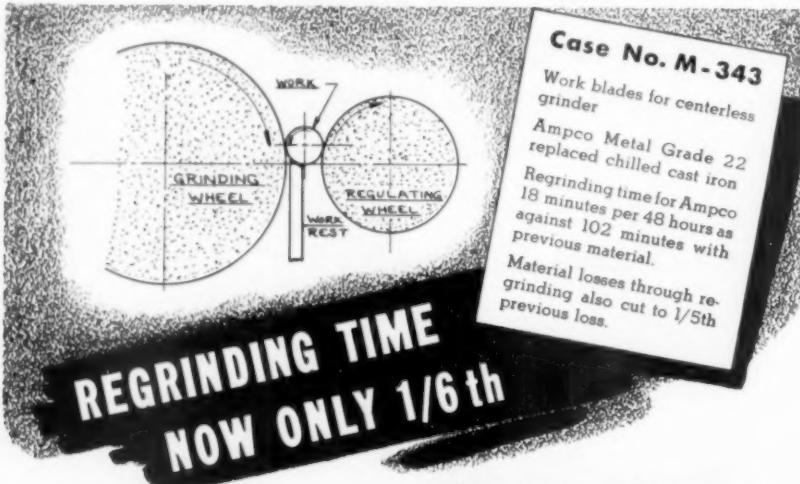
(666) Future Planning

Blueprints of the Future. 8 pp. The National Tool Company, 11200 W. Madison Avenue, Cleveland, Ohio. This is the first issue of a little magazine issued by this concern which will discuss such subjects as the future of industry, science and economics, and the probabilities of the postwar world. Illustrations are included in this piece of new literature.

(667) Tool Grinder

Hammond Carbide Tool Grinders Keep 'Em Sharp. 8 pp. Hammond Machinery Builders, Inc., Kalamazoo, Michigan. This new bulletin shows a complete line of carbide grinders manufactured by this concern, including a combination chip breaker and cup

(Continued on page 188)



Work Blades of AMPCO METAL Out-Perform Previous Material

Constant wear on the work blades of centerless grinders plays havoc with the life of the pieces. As you know, regrinding is usually frequent, causing loss of time and production. But, in the above instance, blades of Ampco Metal Grade 22 stood up under the abuse — far outperformed previously used chilled cast iron. The savings in time and material were decidedly worth while.

The hardness of Ampco Grade 22 (321-352 Brinell), plus its high physical properties, makes it desirable for this service. Ampco Metal, however, is made in 6 grades with a range of physical properties, so that many varied conditions can be met.

This case history is typical of Ampco service — you may have metal problems in other fields. Undoubtedly, widely used Ampco Metal has paralleled your conditions. Let our engineers advise you as to how this remarkable alloy can save you time and money. Ask for catalogue 22.

AMPCO METAL, INC.

DEPARTMENT TE3

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AMPCO
METAL

THE METAL WITHOUT AN EQUAL



Your **TYPE OF PRODUCTION**

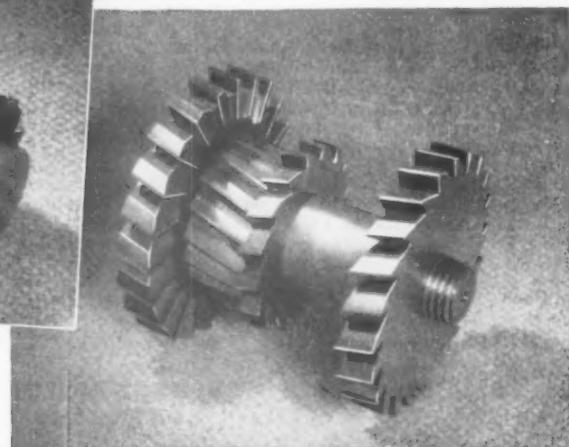
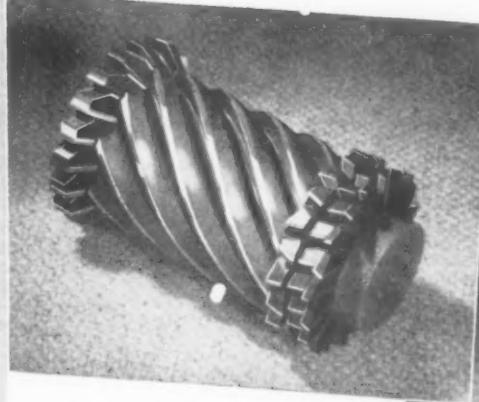
**Designed and Built
into every
MILLING CUTTER**

Pictured are only four of a great number of types of high speed steel milling cutters which were in production at the same time in the Morse Tool Company plant. All are special tools, designed and built to perform specific cutting operations.

In your production, the requirements for milling cutters may be very unusual. It is in such cases that the experience and facilities of the Morse Tool Company can be of definite value to you. The tools will be made exactly to your specifications or, if you desire, the cutters best suited to your purpose will be designed in our Engineering Department. So that your inquiries for information or quotations can be handled without delay, it is essential that you furnish us with all necessary blueprints.

Complete lines of standard high speed tools are also manufactured by Morse Tool Company.

Among the Products
of
MORSE TOOL CO.
are
**SPECIAL MILLING
CUTTERS**
★
**GANG MILLS
AND ARBORS**
★
**FORM RELIEVED
CUTTERS**



Morse Tool Company

116 E. GOLDENGATE ST.
DETROIT • MICHIGAN

NEW LITERATURE

wheel grinder. Each is illustrated and the various parts are described. Features of the grinders are given and the specifications are listed.

(668) Diamond Wheels

Secomet Diamond Wheels. 34 pp. J. K. Smit & Sons, Inc., New York City. This new illustrated booklet lists many types and sizes of resinoid-bonded and metal-bonded diamond wheels. It includes an explanation of diamond wheel markings and complete specifications and prices are included.

(669) Inspection Fixture

Trico Caliper Type Fixture. Trico

Products Corporation, Buffalo, New York. This new piece of literature describes and illustrates a new caliper type fixture for gaging internal dimensions with the Micro-Chek inspection instrument manufactured by this concern. Specifications are included.

(670) Arc Welding Equipment

New Advances in Arc Welding Equipment Design. 9 pp. Harnischfeger Corporation, Milwaukee, Wisconsin. This bulletin which was written by F. J. Hirner, welding specialist for this concern, and points to great opportunities for welding. He outlines the modern goal in equipment design and weld-

ing technique. Included in the bulletin is a description of the operating principle of this company's P&H welders. Bulletin is illustrated.

(671) Taps and Tapping

How to Sharpen Taps. 4 pp. Greenfield Tap and Die Corporation, Greenfield, Mass. This new folder gives 6 main directions along with illustrations on how to sharpen a tap. The folder also includes illustrations and directions on how to sharpen a "Gun" tap.

(672) Machinery Vibration

B. F. Goodrich Vibro-insulators. 12 pp. B. F. Goodrich Company, Akron, Ohio. This new catalog, recently revised and reprinted, tackles the problems of isolating vibration, shock, or noise. Furnished with the catalog is an engineering work sheet which, when filled out by an engineer or plant superintendent, gives the company all the information needed to recommend the proper type of Vibro-insulator.

(673) Longer Tool Life

Jumbo size wall poster. Vascocoy-Ramet Corporation, North Chicago, Ill. Measuring 48 by 27 inches, this new wall chart shows graphically four ways to get longer life from cemented carbide tools. It is said to be in accordance with the WPB request for visual educational posters to be of assistance to workers in defense industries.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(674) Etching Stamp

Inspection and Work Identification Stamps. 4 pp. Jas. H. Matthews and Company, 3942 Forbes St., Pittsburgh. This new bulletin illustrates and describes a new type of etching stamp made of a synthetic material. Pocket style, peg and pin and pencil top stamps, band numberers, steel inspection stamps, and a few of the symbol designs are shown.

(675) Milling and Jig Boring Machine

Linley High Speed Vertical Milling and Jig Boring Machine. 4 pp. Linley Bros. Company, Bridgeport, Conn. This new bulletin describes such features of this machine as the micrometer screw feed head, compound table assembly, compound drive, and counterbalance to remove backlash.

(676) Comparator Charts

Helping You to Get the Most From Your Projection Measuring Equipment. 16 pp. Industrial Engineer's Specialties Division, The Universal Engraving & Colorplate Company, 588 Monroe, Buffalo, New York. This new bulletin describes and illustrates a new system which makes use of plate glass $\frac{1}{8}$ inch thick on which an extremely translucent drawing paper has been cemented. The drawings made on this glass are reproduced on another glass which is called an engineer's transparency or comparator chart and is said to be ideal for all contour projection equipment.

THE END.

THE TOOL ENGINEER



Happy Workers are Seldom Absent

When workers enjoy their jobs they just simply don't want to be absent. And every good American enjoys his work if he understands it and can do it well. But today so many men and women who wish to give their best in the war effort are assigned tasks for which they are totally unskilled, with the result that they are unhappy.

• Management, in the stress of quickly getting into production, has sometimes ignored the good planning and proper tooling which would permit the use of unskilled labor with the least aggravation. In some instances the nuisance value of poor tooling has caused a turn-over in labor and an amount of absenteeism that rightly should not be chargeable to labor at all, but is primarily a management problem.

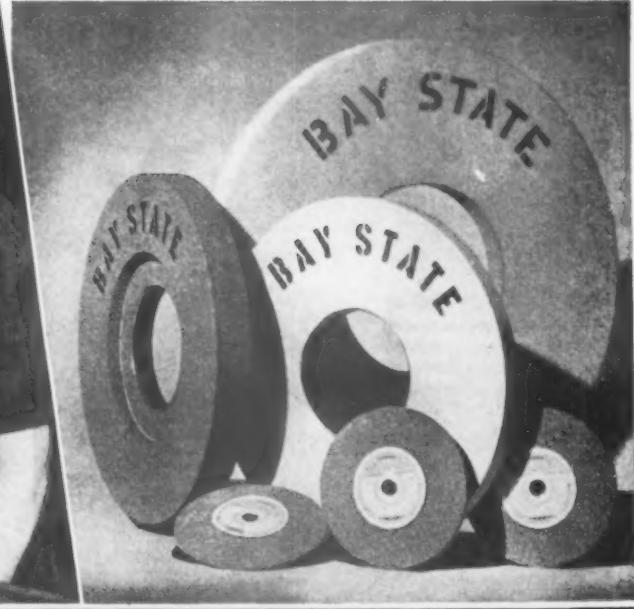
• La Salle engineers have worked with many great American companies in their wartime planning and tooling, in the development of fixtures that minimize the possibility of errors and that take the skill element out of the operation. In reducing tool aggravation, the worker becomes more satisfied with his job and is much less likely to absent himself from it.

• Perhaps your plant has a problem in tool, fixture, and special machine design, or in plant layout. No matter what your production need, La Salle will be glad to discuss it with you at no cost. Just write, wire, or phone us today.

LA SALLE DESIGNING CO., 628 W. Lake St., Chicago, Ill.
AL J. CONN, MANAGING DIRECTOR

LA SALLE

PRODUCTION AND MANAGEMENT ENGINEERING



THEY'RE DOING A "SWELL" JOB!



. . . and "hats off" to women operators like these and thousands of others who have stepped into industry to help fight this war!

Our superior allied battle-front action is dependent to no little degree on the skill and courage of our women on the production line. Long will we remember their great contribution.

BROACH GRINDING

Photos courtesy of LaPointe Machine Tool Co.

BAY STATE
ABRASIVE PRODUCTS CO., WESTBORO, MASS. U.S.A.

ROTOREX GRINDER FOR ALL TOOLS

ALL ATTACHMENTS
ARE SELF-CONTAINED
UNITS AND READILY
INTERCHANGEABLE

QUICK DELIVERY



DOUGLAS MACHINERY CO. INC.
150 BROADWAY, NEW YORK, N.Y.

ETCHING STAMPS for CODE MARKING
NOW MADE IN AN
Amazing New Material

Results of tests in actual production have shown that Matthews new "S-22" Synthetic outlasts the best rubber or other synthetic stamps from three to four times! The new "S-22" Synthetic is unaffected by acid etching inks.



The popular Peg Style illustrated is used where large volume inspection stamping of metal parts and assemblies is required.

WRITE FOR BULLETIN S-CATALOG 146
This valuable bulletin illustrates the various styles of stamps available. Write for your copy today!

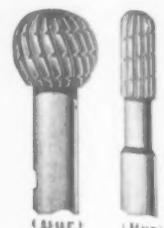
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3945 Forbes Street
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CHICAGO PHILADELPHIA



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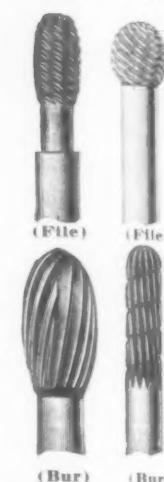
ARE YOU GETTING
ROTARY BURS
WHEN NEEDED?



MARTINDALE ROTARY BURS AND FILES...

are usually shipped within one week after the order is received. Nearly 200 styles from which to choose — made from High Speed Steel.

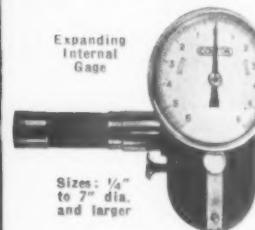
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THE MARTINDALE ELECTRIC CO.
1421 HIRD AVE. CLEVELAND, OHIO

Trainees gage dependably to fractions of .0001" with **COMTORPLUG!**

Enables the relatively unskilled to perform precision gaging
COMTORPLUG



Sizes: 1/4" to 7" dia. and larger



Comtorplug is a precision internal gage that gives positive 2-point gaging, due to patented features of automatic centering and alignment. Not a limit gage — not a passing reading. Shows ACTUAL MEASUREMENT, to fractions of .0001", of any part of a bore, detecting out-of-round, front or back taper, barrel shape, bell mouth, etc., and gaging to the very bottom of blind holes. Widely used in ordnance, airplane, automotive, electrical and other industries where precision of bores is vital.

Request Bulletin 27

THE COMTOR CO.

70 Rumford Ave.
Waltham, Mass.

THE TOOL ENGINEER

You have backed us up
with quick shipments...

EXCERPT FROM CUSTOMER'S LETTER

The THREADWELL distributor in YOUR area is your own personal threading tool expeditor.

You need a certain size tap . . . and need it at once. Perhaps important production schedules and deliveries hang on a thread . . . the thread that must be cut by a certain size tap to finish a certain part of your order.

Call your THREADWELL distributor! He will give *personal attention* to your needs . . . and so will we.

Don't misunderstand us. We are up to our necks in high priority orders. We can't deliver anything you might need anytime. But we can and do give our *personal attention* to every order. Often this *personal attention* can break bottle-necks and get customers the tools they want when they want them.

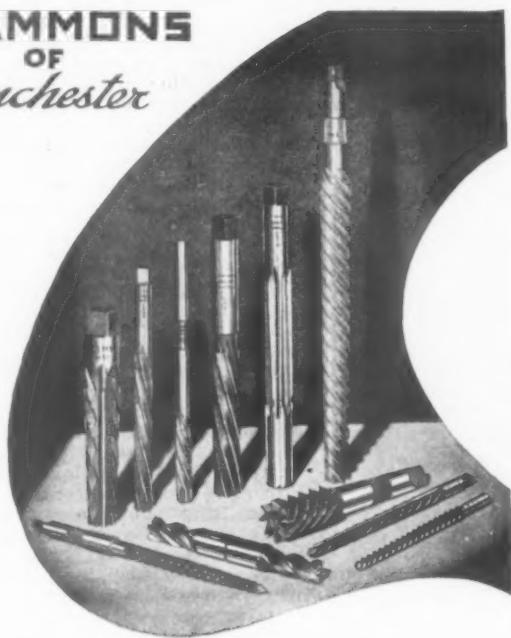
THREADWELL TAP AND DIE CO., Greenfield, Mass., U.S.A.



Threadwell
"TAPS OF DISTINCTION"

SALES AGENTS
Globe-Bridg Machinery Co., Montreal
Rational Stylur Ltd., London

GAMMONS
OF
Manchester



PRODUCTION TOOLS
ORIGINATORS AND
MANUFACTURERS OF HELICAL
FLUTED TAPER PIN REAMERS

THE GAMMONS-HOAGLUND CO., MANCHESTER, CONN.

MARCH, 1943

NO TOLERANCE PROBLEM ON HASKINS

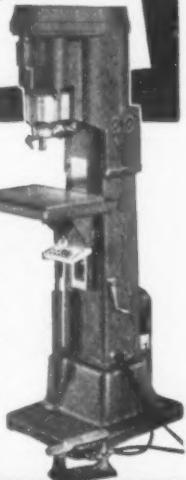
2 FEATURES

Insure Continuous, Trouble-Free
TAPPING PRODUCTION
...and only Haskins has them

AIR OPERATION uniformly controls the accuracy of the work. Each part precision tapped exactly like every other.

PIECE-PART CONTROL, applicable on many jobs, makes tapping practically automatic. Placing the part in the fixture actuates a micro-switch and—air does the rest.

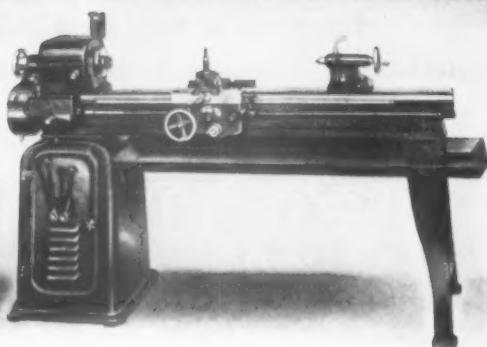
Tapping the Haskins way is faster, definitely more accurate, definitely less costly. Send for **TAPPING TIPS**—new literature that gives many money-saving, money-making ideas. R. G. Haskins Company, 2756 W. Flournoy Street, Chicago.



HASKINS

*Precision
TAPPING
EQUIPMENT*

SHELDON



SHELDON BB-1242 WQ

Precision Lathe

★ This quality 12 in. ball bearing tool room lathe is built for precision work and will retain its accuracy under long and hard usage. It has extra collet capacity (to 1" round), the finest precision ball or roller bearings obtainable, an improved heavy-duty, double wall apron with power cross feed; full quick change gears and full bowl headstock. Its improved Sheldon 4-speed, V-belt, lever-clutch operated, undersleath motor drive is entirely enclosed in the pedestal leg and has anti-friction bearings. It is so designed that spindle belts operate thru a standard 1-piece bed. This bed is bridge-braced with heavy cross girds and has hand scraped ways—2 V-ways and 2 flat ways.

★ If interested in 10", 11" and 12" quality lathes be sure to see the SHELDON.

SHELDON MACHINE COMPANY, INC.
4252 N. Knox Ave.
Chicago, U. S. A.

Handy Andy Says—

T.M. REG. U.S. PAT. OFF.

WITH THIS ISSUE, another A. S. T. E. year ends; now, we start anew, to build on an ever strengthening foundation.

That goes for THE TOOL ENGINEER as well as for the Society.

From an editorial viewpoint, the past year has been marked with progress and evident improvement. I state this as fact, having too fair a sense of values to depreciate the work of the Committee of which I have been chairman.

But then, as far as busy men could give of their time, I've had the support of my co-workers and the friendly encouragement of our host of readers. And last, but not least, the Exec. Com'tee has implied its confidence by leaving me to do a job without interference or cramping of style. Thanks, everybody!

We start the new year under a handicap, but one that we'll turn to advantage. Rationing has hit the editorial sanctum as well as the home, which

means that, to conserve paper, we'll have to strip to essentials. But, we'll do it without sacrifice of quantity or quality, we'll improve as we have been improving, giving you the most and the best in articles related to tool engineering. You'll get QUALITY, we promise you that.

However, there must necessarily be restrictions as on the wordage for Chapter Doings, but you Chapter scribes can condense and get quality too.

For that matter, I'm rationed too. Wally Scotten (scribe of the checkered shirt) having restricted me to 144 lines. But I'll fool 'em by using 4 cyl. wds., stretching mileage the way these peewee cars give you 25 m. p. g. Like the rationed drop in a gallon of gas, we'll have to make every word count.



MCCRORSKY Super Adjustable Reamers conserve time and high-speed steel, give extreme accuracy. Thanks to the SUPER design, the inserted blades can be adjusted quickly and uniformly, with a minimum of blade stock sacrificed in resharpening. And the rugged SUPER body is good for many sets of replacement blades.

Full details in McCrosky Bulletin 16-A.

Grinding instructions in the McCrosky Reamer Manual.

MCCRORSKY
Super ADJUSTABLE REAMERS

EST. 1904
MCCRORSKY
TOOL CORPORATION
MEADVILLE, PA.

At time of writing, the Allied Nations conference in Africa is still headline news — and bad news for the Axis.

For the first time, an American president conferred at a foreign battlefield, and for the second time in American history, the ultimatum of unconditional surrender has been delivered to an opponent. That defy implies the absolute confidence of Allied leaders in our ultimate victory and an equal determination to achieve it.

And, in its very audacity (coming as it did when the scale still sways in the balance) it must have a tremendous effect on the morale, positive and negative, of the peoples of occupied as well as enemy lands.

It does not, however, imply a victory in '43. That is optimism without tangible foundation, although '43 will probably mark the beginning of the end as far as Germany and Italy are concerned.

And largely, the determining factor will be American mass production, with which no other nation can successfully compete at this time. This does not disparage our armed forces; it means that our fighters should be able to balance numerical odds because the industrial front produces superior equipment enough of it and on time. That is, if we produce.

In that connection, Eddie Rickenbacker hurled a challenge at organized labor that its leaders have sharply criticised.

They impugn him a stooge of the "interests", put the onus for delay on the Army, the manufacturers and, by implication, on industrial executives and engineers. But, these groups do not strike! That — and slowdown — is a privilege (?) of democracy arrogated by groups that subordinate the nations needs to their own immediate ends. Such stoppage of vital production would be considered punishable sabotage in enemy lands. Why not here?

It sums up to this, that if there are strikes, and slowdowns, and absenteeism that transcends peacetime delinquency, then Rickenbacker is right.

The only logical rebuttal is proof of uninterrupted production. As for the Army, it is fighting and dying, and men who die vindicate their patriotism in blood. There is no rebuttal to the final sacrifice. And, since industrial executives and engineers stay on the job, planning better and easier ways to produce, we can absolve them as well.

Anyway, let's all work together, then
(Continued on page 194)



Natural...

IN ANY SHOP

*Self Centering
Shaft Vise*

This modern machine vise is a "natural" because it just naturally is an asset to any machine shop. For machining slots and keyways in shafts or spindles, $\frac{3}{8}$ " to $\frac{3}{4}$ " diameter—suitable for horizontal or vertical mounting. Setting of vise remains unaltered for

all work diameters—insures accurate radial cuts. Hardened V jaw reversible in vise—equal movement of two jaws locates shafts correctly in V jaw.

Base size 8" x $7\frac{1}{4}$ ". Approx. wt. 80 lbs.

Write for circular.



**THE PRODUCTO
MACHINE COMPANY**

990 Housatonic Ave., Bridgeport, Conn.
3017 Medbury

DETROIT, Michigan

Federal Taperlock Plastic GAGE HANDLES

Immediate Delivery!

- ★ Made of durable plastic material, they are lighter than any metals used for Gage Handles.
- ★ This light weight makes gages more sensitive to touch and reduces fatigue caused by long continuous use—particularly in the case of women inspectors. Insulates from bodily heat, helping maintain accuracy of gages.
- ★ Made to fit gages of standard sizes. Easily marked for identification with the same lettering used for metal handles.
- ★ The low cost represents a real saving. Available in 6 standard sizes, in any quantity and without delay.
- ★ **COLORS!!!** A new feature in Federal Gage Handles. Permits quick identification of types or sizes without measuring gages. Available in BLACK—RED—YELLOW—GREEN.



FEDERAL TOOL CORPORATION
402 North Leavitt Street, Chicago, Illinois

MARCH, 1943

In War, as in Peace...

CERRO ALLOYS

SAVE TIME and CUT COSTS!

CERROMATRIX (Melting Temp. 250° F.) For securing punch and die parts, anchoring machine parts without expensive drive fits, short run forming dies and other metal-working applications.

CERROBEND (Melting Temp. 158° F.) Used as a filler in bending thin-walled tubing to small radii. Easily removed in boiling water. Also used for aircraft assembly jigs, templates for forming dies and other purposes.

CERROSAFE (Melting Temp. 190° F.) Used to accurately proof-cast cavities such as molds, gun chambers, forging dies, etc. and for many similar applications.

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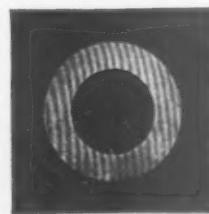
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40 WALL STREET - - - NEW YORK, N. Y.

for COMPARISON
MEASUREMENT

for Checking
SURFACE
FLATNESS
use
ACME GLASS OPTICAL FLATS



Acme Glass Optical Flats used in conjunction with your gage blocks make comparison measurement simple and easy. Accurate measurement in millionths can be quickly obtained with this equipment.

The Acme Monochromatic Lamp provides light of a single wavelength necessary to make the interference bands stand out clear and sharp.

Write for complete details and prices today!

ACME INDUSTRIAL CO.

Makers of Standardized Jig and Fixture Bushings

Telephone: MONroe 4122
208 N. Laflin St. Chicago, Ill.



HANDY ANDY SAYS

there will be no grounds for charge and countercharge. Unity for Victory!

As a fitting conclusion, I would reiterate my faith in the loyalty of our citizens of German origin.

Capt. Rickenbacker symbolizes that loyalty, nor may we forget Gen. Pershing of world war No. 1. Then, there is "Ike" Eisenhower, and scores of gallant American leaders in the present fracas, as well as legions of fighters in the ranks, all of German descent.

They are American to the core, fight for the survival of the American Way. And just so American engineers of German origin, many of them members

of the A. S. T. E., are extending themselves to insure the defeat of the Axis powers.

Americans by choice who believe in our way of life are among the staunchest champions of democracy. Remember that.

THE END.

YOU MUST SPEED PRODUCTION

The machine or tool that will double the production on one of your "tough" jobs may be described in this month's NEW EQUIPMENT department. . . . page 165.

"MUSIC WHILE YOU WORK"

Plan maintains production, records show

TO CUT down the production lag caused by mid-afternoon fatigue, some 500 factories in the U. S. have installed loud speaker systems and are playing recordings of popular, classical and operatic music for their workers.

The music played is identical to that heard in the background in restaurants, hotels and other public places. In this field Westinghouse pioneered in 1935 when loud speaker units were being tested near one of their assembly lines. After tests were completed, workers asked that the music be continued and it was. The idea is enjoying widespread acceptance today.

WIDESPREAD USE IN DETROIT PLANTS

Results: Detroit, booming-war production center, is number one user of the "music while you work" plan. The Carbolooy Company, Champion Spark Plug Company, Kenlee Corporation, N. A. Woodworth are a few of the Motor City concerns receiving music service piped via telephone line from a transcription studio to the factory speakers. The music makes repetitive jobs seem less monotonous, thus reducing boredom and keeping workers cheerful, more alert. Accidents become fewer, number of rejects are reduced, steady production is maintained, records in these plants indicate.

In installing the service the distributor first makes a survey of the plant. Personnel data on the ratio of men to women, their respective average ages, the sections from which they come and the type of work they're doing is necessary information if the program is to keep production as high as possible.

High noise level is not an insurmountable obstacle. Vibration frequency of vertical cut transcriptions is much higher than that of most factory noise and virtually spans the sound wave range audible to the human ear.

During working hours, the music is strictly instrumental; anything with lyrics would have the employees trying to catch the words, forget the job. At lunch time and rest periods records with vocalists are used. Kelsey-Hayes Wheel Company, Detroit, has a hook-up for newscasts and radio programs.

MACHINE TOOL BUILDER'S EXPERIENCE

Usually, the music is not continuous but spotted in during the day, with a maximum of two hours for each eight-hour shift. Starting after the first couple of hours of work when the employee begins to get tired, the music is played at 15-minute intervals. Fifteen minutes of music every half hour has been found the most effective dose.

Some systems are more elaborate, as for example that at the Fellows Gear Shaper Company, Springfield, Vt. There, a regular sound-proofed studio with complete broadcasting equipment has been installed.

In addition to music, birthday greetings and a welcome to new workers are broadcast in the plant loud speaker system. All new babies in the families of employees are announced, and lost and found announcements have effected the return of many tools and personal items, the company reports.

THE END.



We make every type of diamond tool necessary for all kinds and sizes of grinding wheels.

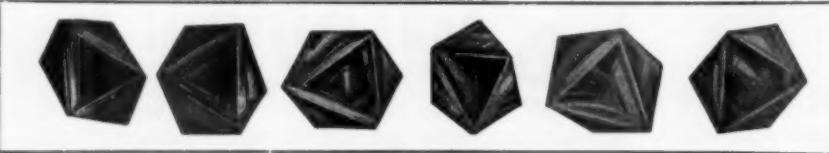
Our long experience in the manufacture of diamond tools is offered you in the solution of your grinding problems. Write for Information and Circulars.

F. F. GILMORE & CO.

285 Columbus Ave., Boston, Mass.

2834 East Grand Blvd.

Detroit, Michigan



COLBORNE



Speed Lathes

SPEED UP PRODUCTION

USED FOR FINAL FINISHING OPERATIONS

ECONOMICAL POLISHING LAPPING, BURRING, BURNISHING, FINISHING

OF
GEARS
SHAFTS
DIES
GAGES
BALL RACES
SMALL PARTS
ETC.



Built to meet the requirements of those desiring a heavily constructed, smooth running machine of highest quality.

Has motor in base with variable speed control, using REEVES standard pulley and belt.

Smooth automatic brake acts instantly when switch is thrown. Collets or chuck may be used.

GOOD DELIVERY

MACHINERY BUILDERS SINCE 1879

WRITE FOR DETAILS

COLBORNE MFG. CO.

157 W. Division St., Chicago, Ill.

COLBORNE—THE SPEED LATHE PEOPLE

* FOR
INSPECTION
GAGING ...



BARTEL T

PEDESTAL INDICATOR

* Here's a handy new gage that will be found useful in many ways around any production or jobbing shop. In the picture it is being used on a surface plate to gage height on an inspection operation. The pedestal permits an adjustable height range of from 0 to 3 inches and the dial reads in tenths. Write for circular showing a variety of other uses for the **BARTEL T PEDESTAL INDICATOR**.

BARTEL T ENGINEERING COMPANY
1214 PARTRIDGE AVE. - - - BELOIT, WIS.



WELDON ROBERTS

Brightboy

REG. U. S. PAT. OFF.

The Versatile, Light Abrasive for De-Burring, Cleaning, Finishing, Polishing



WITH MINIMUM DIMENSIONAL LOSS!

BRIGHTBOY is distinguished from other abrasives by its resilient action; the soft-rubber binder cushions the abrasive. In use, the abrasive recedes into the binder, falling free as the rubber is worn away. This unique action enables Brightboy to bridge the gap between a grind and a buff—reducing operations and minimizing dimensional loss. In many instances, Brightboy does the desired work in one operation. This means GREATER PRODUCTION FOR YOU.

Available in wheels, sticks, blocks, rods and special shapes for manual and machine operations. Ask your mill supply house for catalog and prices, or write—

BRIGHTBOY INDUSTRIAL DIVISION
Weldon Roberts Rubber Co. Newark, N. J., U. S. A.

Columbia TOOL STEEL

FOR VICTORY—

Use "Good Tool Steel" for maximum war production.

Use the "know how" and experience of our service engineers.

—And use your money to buy War Bonds.

*It pays to use
Good Tool Steel.*

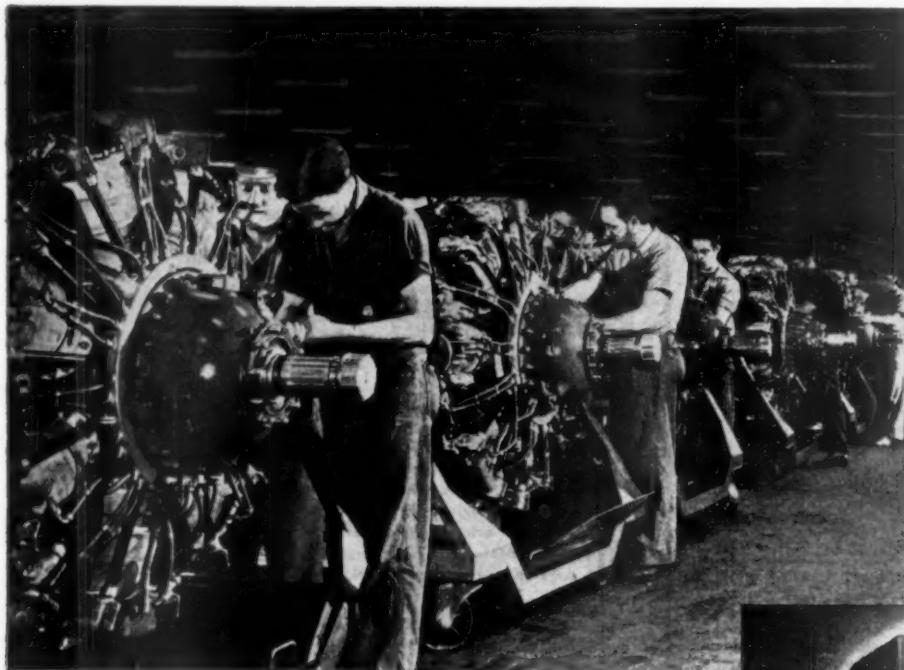
COLUMBIA TOOL STEEL COMPANY

ARTHUR T. CLARAGE, PRESIDENT

GENERAL OFFICE AND WORKS

500 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

LINES BEHIND THE LINES



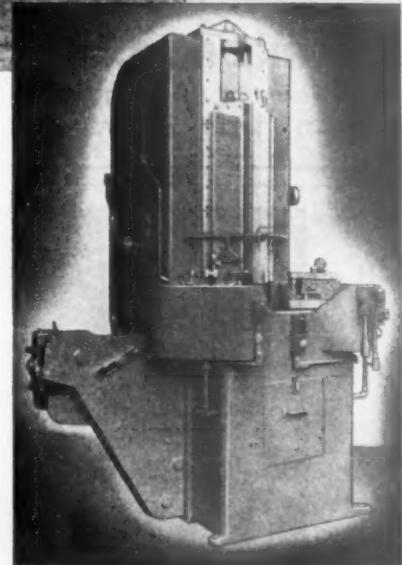
FROM PRODUCTION
LINES TO FIRING
LINES, IN WAR
AS IN PEACE, THE
AUTOMOTIVE
INDUSTRY DE-
LIVERS THE GOODS



NO INDUSTRY has gone more "all out" for war than the automotive. None manufactures a greater amount or variety of war matériel. For many years the industry has relied on broaching as a better way to do many metal-working jobs—the only *right* way to do some!

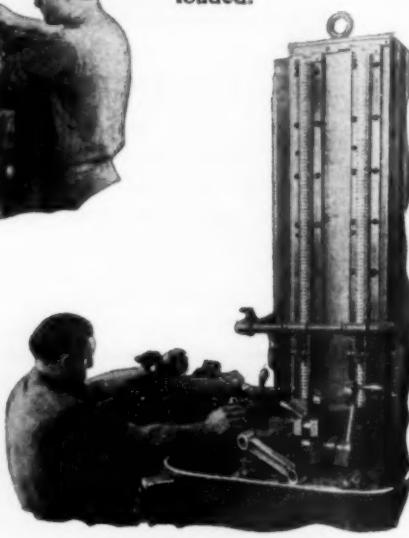
* * * * *

RELATIVELY LOW COST Single Ram Machine performs two different surface broaching operations. One tool (left) broaches flat on rod, while second fixture is being loaded.



FAST PRODUCTION with high finish is obtained by broaching sides of articulated rod for aircraft engine, shown in position (left) on American SB-48-15-2 Single-Dual Machine.

RADIi ARE FINISHED (right) with second broach while first fixture is being re-loaded. One operator plus one machine plus tooling by American—equals a precision job at a production rate!



**BROACHING IS BETTER
THE *American* WAY**

American
**BROACH AND
MACHINE CO.**

ANN ARBOR, MICHIGAN
BROACHING MACHINES
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BROACHING TOOLS
SPECIAL MACHINERY



AMERICAN SOCIETY OF TOOL ENGINEERS, Inc.

2567 W. GRAND BOULEVARD, DETROIT, MICHIGAN

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1942



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1943

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BURNSIDE, D. D.—2001 S. Kings Highway, St. Louis, Missouri.
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COLE, L. M.—407 Velasco St., Houston, Tex.
COLLINS, H. E.—6668 Park Lane, Houston, Tex.
COX, FLOYD A.—2506 Prospect Rd., Des Moines, Iowa.
CRAWFORD, R. E.—384 Durie St., Toronto, Ontario, Canada.
CRONE, FRANK R.—13428 Stahelin, Detroit, Michigan.
CURTIS, FRANK W.—Van Norman Machine Tool Co., Springfield, Massachusetts.
d'ARCAMBAL, A. H.—Pratt & Whitney Div., Niles-Bement-Pond Co., W. Hartford, Conn.
DAWLESS, FRED J.—131 Park St., New Haven, Connecticut.

DAWSON, WILLIAM A.—Otis-Fensom Elevator Co., Ltd., Hamilton, Ontario, Canada.
DENNIS, ARTHUR J.—1922 N. Highland, Hollywood, California.
DICKETT, E. W.—625 N. Court St., Rockford, Illinois.
DIEHL, FRED—General Electric Co., Bldg. 40 Schenectady, New York.
DOTY, FLOYD W.—R. R. 5, Box 632, Houston, Texas.
DOUGLASS, ROBERT B.—Canadian Car & Foundry Co., Propeller Div., Montreal, Canada.
EATON, F. W.—928 Penrose Ave., Detroit, Michigan.
ELLAY, RAY—1448 Myron St., Schenectady, New York.
FIDLER, E. W.—General Electric Co., Bldg. 40 Schenectady, New York.
FIDLER, W. Z.—Rohrings Eng. Co., Rock Island, Illinois.
FLATER, DON T.—341 Massachusetts Ave., Highland Park, Michigan.
FORSMAN, DAVID C.—2010 Briarcliff, Detroit, Michigan.
FRANKFURT, PAUL, SR.—1623 Morris St., Philadelphia, Pennsylvania.
FRICK, JAMES J.—4758 Springrove Ave., Cincinnati, Ohio.
GILCHRIST, JOHN E.—28 Grand Ave., Calumetville, Illinois.
GREER, EDWARD L.—7 Hughson Place, S., Hamilton, Ontario, Canada.
CURTIS, FRANK W.—Van Norman Machine Tool Co., Springfield, Massachusetts.
d'ARCAMBAL, A. H.—Pratt & Whitney Div., Niles-Bement-Pond Co., W. Hartford, Conn.
HAWKINS, CLYDE L.—14400 Woodrow Wilson, Detroit, Michigan.
HAWKY, G. J.—626 Penton Bldg., Cleveland, Ohio.
HOLLAND, I. F.—Pratt & Whitney Div., Niles-Bement-Pond Co., W. Hartford, Conn.

IEKEL, WILLIAM—322 S. Green St., Chicago, Illinois.
JOHNSON, EARL V.—1203 Patterson Road, Dayton, Ohio.
KANE, EARL J.—322 Thrush Ave., Peoria, Ill.
KASSEBOHM, WALTER—1325 Ordway St., Berkeley, California.
LINDEGREN, C. J.—93 Grand St., Worcester, Massachusetts.
LIPPARD, ROBERT M.—10 New Bond St., Worcester, Massachusetts.
LUCAS, CECIL—51 Flint St., Rochester, New York.
MARSH, LEON F.—8 Drury Rd., Edgewood St., Providence, Rhode Island.
MARTIN, L. P.—39 Marguerite Drive, Oakland, California.
MARTINDELL, FRANK—4615 Wolf Road, Western Springs, Illinois.
MARTIN, JACK—2572 Ohio Ave., South Gate, California.
MCMONAGLE, JOHN A.—1007 Berrill Ave., Yeadon, Pennsylvania.
MITCHELL, A. H.—226 Paul Ave., Syracuse, New York.
MORRIS, RAY H.—7 S. Main St., W. Hartford, Connecticut.
NIEMAN, ERNEST H.—2840 Spring Ave., St. Louis, Missouri.
ORCHARD, THOMAS P.—10 Crofton Road, Montclair, New Jersey.
OSWALD, THOMAS—2318 Barberly St., Dallas, Texas.
PECK, ANTON—801 W. 10th St., Los Angeles, California.
PEIRCE, W. B.—Flannery Bolt Co., Bridgeville, Pennsylvania.
POOK, HERMAN O.—The Inland Mfg. Division, General Motors Corporation, Dayton, Ohio.

POWIS, HENRY A.—225 Santa Monica Blvd., Santa Monica, California.
RAWSON, F. J.—3327 Military Road, Washington, D. C.
RINGLING, WALTER—818 W. Greve St., Mishawaka, Indiana.
ROESEL, MILTON L.—87 Billmeyer Drive, Rochester, New York.
ROSS, M. M.—631 W. Bluff, Wichita, Kansas.
RYLANDER, ANDREW E.—5 Branson Publ. Co., 2842 W. Grand Blvd., Detroit, Michigan.
RYNO, H. WILSON—1000 Broad St., Newark, New Jersey.
SIEGL, JOSEPH A.—1200 Kilburne, Detroit, Michigan.
SINGER, L. G.—11 Front St., E., Toronto, Ontario, Canada.
SPROUT, R. T.—932 Silverstone Plaza, Nashville, Tennessee.
THOMAS, C. D.—730 Riverside Ave., Elmira, New York.
THOMAS, JOHN—1860 Box, Louisville, Ky.
THOMAS, KENNETH F.—65 Argyle Road, Hartford, Connecticut.
THOMPSON, ARNOLD—80 Delamere Ave., Toronto, Ontario, Canada.
TURNER, H. R.—1418 Elliott Ave., Houston, Texas.
WAGNER, WALTER—16505 Warwick Ave., Detroit, Michigan.
WEARN, E. N.—19 Bowles Ave., Toronto, Ontario, Canada.
WEBER, LOU—3055 Colerain Ave., Cincinnati, Ohio.
WENTZEL, HORACE—1702 W. Washington Ave., South Bend, Indiana.
WINTER, OTTO W.—322 S. Green St., Chicago, Illinois.
YOUNG, W. W.—238 Main St., Cambridge, Massachusetts.
YOUNGER, JOHN—Prof. of Ind. Eng., Ohio State University, Columbus, Ohio.

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*For application blanks and information pertaining to membership in the American Society of Tool Engineers, address the Secretary's office, 2567 W. Grand Boulevard, Detroit, Michigan. Telephone: TY 50145.

*Senior initiation fee is five dollars. Dues eight dollars per year for senior grade membership and five dollars per year for junior grade membership. Junior initiation fee is two dollars.

A. S. T. E. DOINGS

Boston. Warren Ames was elected chairman of the Boston Chapter at the February 11th meeting of the Chapter which was held at Schrafft's Restaurant. Other Chapter officers elected for the year 1943-44 included Henry Richards, 1st vice chairman; Jack Savits, 2nd vice chairman; Stanley Rowe, treasurer; and Ernest Vansaw, secretary.

Ross McKenney of Hanover, N. H., was the speaker of the evening and told the Chapter members some of his experiences as a guide and woodsman. A moving picture was shown at this meeting entitled "Target for To-Nite."

Executive Secretary, Adrian Potter, was a visitor at this meeting and presented John W. Geddes and A. D.

Forbes with pins in appreciation of their work for the society during the past years.

Bridgeport (Fairfield County). The technical session of the January 13th meeting of this Chapter, which was held at the Stratfield Hotel, featured a talk by Mr. W. B. Peirce. Mr. Peirce showed slides of the change-over from stay bolts to gun barrels at the Flannery Bolt Company.

Coffee speaker at this meeting was Mr. J. Hill, director of Bridgeport State Trade School, who talked on "Converting Man Power to War Defense." Members saw a film through the courtesy of the International Harvester Company which pertained to the Marines.

Buffalo. The January 21st meeting was held at the Lafayette Hotel and featured a speech by Dr. A. Allen Bates, manager of the Chemical and Metallurgical Department at Westinghouse Electric and Manufacturing Company. Dr. Bates gave a talk on Plastics vs. Metals, demonstrating the making of plastic materials and the uses to which they can be applied.

Coffee speaker of the evening was Mr. Santmeyer, who is in charge of apprentice training at the Harrison Radiator Company of Lockport, N. Y. A nominating committee, comprising of F. G. Schwenger and A. C. Siegel, was elected at this meeting.

Chicago. A new attendance record is said to have been set when 350 Tool Engineers and guests attended the February 1st meeting of this Chapter which was held at Huyler's Restaurant. Highlight of the evening was a motion picture entitled, "The Action of Metal Cutting Tools as Seen Through the High Speed Camera." This picture was presented through the courtesy of the General Electric Company and was discussed by Mr. Lee Weller, development engineer for that concern.

Chapter officers were elected at this meeting. The election results were as follows: Frank Martindell, chairman; Wallace F. Ardussi, 1st vice chairman; Rudolph J. Miller, 2nd vice chairman; Fred J. Schmitt, secretary; and Harold M. Taylor, treasurer.

Cincinnati. A joint meeting with the American Welding Society was held at the Hotel Alms on February 9.

Speaker at this meeting was Mr. Burnham Finney, Editor of American Machinist magazine. His subject was "Industry Goes to War."

Columbus. This chapter held its February 9th meeting in the Gold Room of the Hotel Fort Hayes and elected the following men for officers for the coming year: S. J. Matchett, Jr., chairman; H. T. Spoerlein, 1st vice chairman; H. F. Volz, 2nd vice chairman; C. W. Warner, secretary; W. K. Armagost, treasurer.

Speaker at this meeting was Mr. E.

(Continued on page 200)

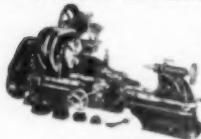
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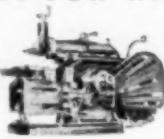
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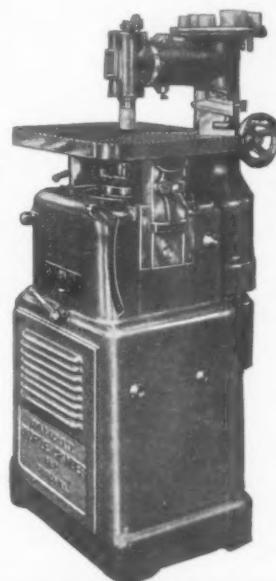
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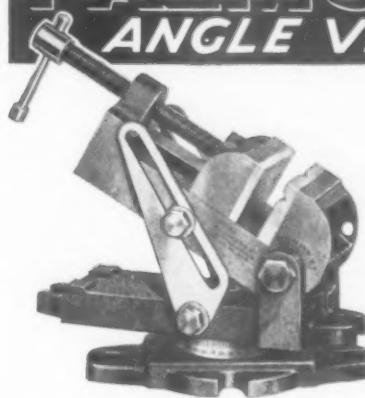
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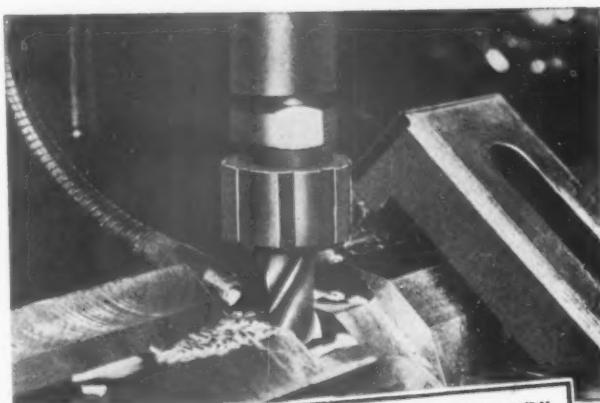
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A. Mallett, welding engineer of the Taylor-Winfield Corporation, who gave a blackboard talk on "Resistance Welding."

Dayton. The Dayton Chapter held an election of officers at its February 8th meeting which was held at the Engineers' Club. Jack Blair was elected Chapter chairman for the coming year; Reber Stupp, 1st vice chairman; George Tillotson, 2nd vice-chairman; George Bollman, secretary; and Bob Wade, treasurer.

Mr. Thomas Sutton, welding engineer of Welding Equipment and Supply Company, spoke on "Suttonizing and

Salvage." Members voted to send Howard MacMillan, retiring chairman, Jack Blair, and Reber Stupp, newly elected officers, to the area meeting in Cleveland.

Detroit. Features of this Chapter's February meeting included a talk by Mr. V. H. Ericson of the Norton Company, a talk by Dr. Caton of the Chrysler Institute and the election of 1943 Chapter officers.

Mr. Ericson, abrasive engineer for Norton Company, spoke on "Refined Surface Finish As Applied to Cutting Tools." Dr. Caton told the members of his recent tour of Southern Educational

Institutions.

Chapter officers elected at this meeting included: George Whitehouse, chairman; Grant Wilcox, 1st vice chairman; J. Delaney, 2nd vice chairman; Otto Mueller, secretary; and Ray Farmer, treasurer.

Elmira. 135 members and guests attended the February 1st meeting of this Chapter held at the Mark Twain Hotel. The speaker of the evening was Dr. Mario Martellotti of Cincinnati Milling and Grinding Machines, Inc. Dr. Martellotti spoke on, "A Comparison of Up and Down Milling."

An election of officers at this meeting brought the following results: Dolph Kylor was elevated to the chairmanship to replace M. Hugh Evans; George N. Morceau was elected 1st vice-chairman to succeed Mr. Kylor; Lester F. Trew was elected 2nd vice-chairman; Karl C. Schmedicke, secretary; and Ivan M. Gowdy was retained as treasurer for his second term.

Fond du Lac. At their February 12th meeting, members of this Chapter elected Arthur F. Schroeder as Chapter chairman; Albert E. Mietzel, 1st vice chairman; William Felten, 2nd vice chairman; Allan L. McKay, treasurer; and Henry S. Faith, secretary.

"National Emergency Steels" was the title of the speech given by Mr. R. W. Roush, chief metallurgist, The Timken Detroit Axle Co., Detroit, Michigan. At the conclusion of the meeting members listened to a recording of Capt. Eddie Rickenbacker's speech which was given before a gathering of the Society of Automotive Engineers in Detroit.

Fort Wayne. Cyril Grindrod was elected chairman of this new Chapter at the February 11 meeting which was held at the Berghoff Grill. Other officers elected included Paul Weitzman, 1st vice chairman; John Astrom, 2nd vice chairman; Milton Kline, secretary; and Doyle White, treasurer.

O. W. Winter, national president, spoke at this meeting and presented the charter to the chapter. Regional Director Horace Wentzell also spoke at this meeting.

Hamilton. Mr. L. Partington, technician on Bofors equipment, Otis-Fensom Elevator Company spoke at the February 12 meeting held at the Royal Connaught Hotel. Mr. Partington told of his experiences as a fire warden during the bombing of Coventry.

Election of new officers also took place at this meeting. Joseph Little was elected chairman; Thomas G. Fechnay, 1st vice chairman; W. F. Faulds, 2nd vice chairman; K. R. Laidley, secretary; and H. C. Coit, treasurer.

Hartford. Approximately 90 members turned out for the "Members Night" meeting which was held at the City Club on February 3rd.

The new 1943-44 Chapter officers elected at this meeting included: Carl W. Moeller, chairman; Richard A. Smith, secretary; Edmond Morancey, treasurer; Henry A. Rockwell, 1st vice chairman; and R. T. Palmer, second vice chairman.

Past Chapter chairman, A. H. d'Arcambal, Irwin F. Holland, Ray H. Morris, Frederic L. Woodcock, and

(Continued on page 202)

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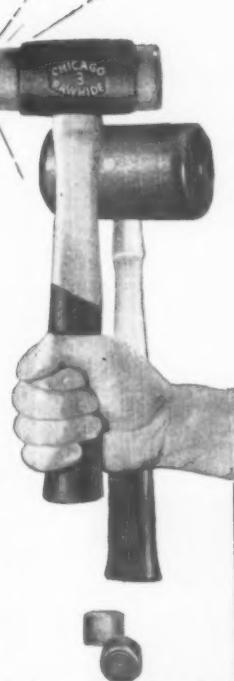


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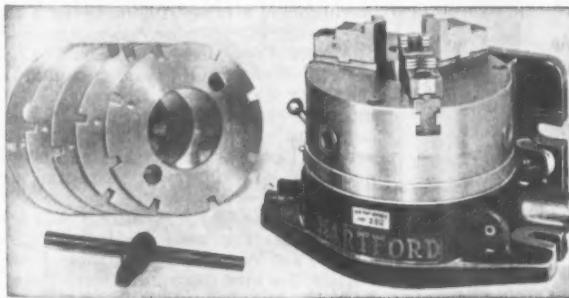
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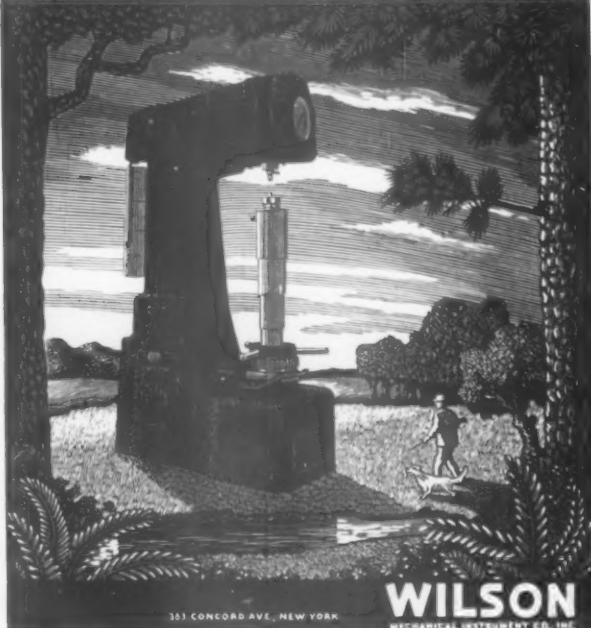


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A. S. T. E. DOINGS

Henry I. Moore received past chairmanship pins.

Houston. The January 11th meeting of this Chapter was attended by about 125 members and friends who heard Mr. E. V. Flanders of Jones & Lamson Company and Mr. W. E. Addicks of the Boston office of Cutler-Hammer Company as co-speakers on the subject of "Thread Grinders."

Mr. Flanders' lecture was illustrated with slides. Mr. Addicks spoke on the electrical control of thread grinders which was also illustrated with slides.

Indianapolis. About 160 members and guests attended the last meeting and heard talks by A. H. d'Arcambal and C. A. Page of Pratt & Whitney.

It has been reported that this chapter took a large part in the War Production Clinic, sponsored by the various engineering groups in the Indianapolis area. Approximately 1200 people attended the Clinic and 820 were at the dinner.

Los Angeles. Arthur J. Denis was elected chairman at the February 11 meeting held at Scully's Cafe. Other officers elected were F. G. Jarvis, 1st vice chair-

man; Anton Peck, 2nd vice chairman; John Wade, treasurer; and William Surwill, secretary.

Sound movie shown at this meeting was entitled "Cradle of Victory" by the Consolidated Aircraft Corporation.



New Hartford Chapter officers. Left to right: C. W. Moeller, R. A. Smith, Edmond Morancey, H. J. Hauck (retiring chairman), H. A. Rockwell, R. T. Palmer.

Kansas City. D. D. Burnside, second vice president of the Society, was the coffee speaker who spoke on the "Purpose of the Society and Organizational Set-up." The technical speaker was H. F. Huffman of the Cincinnati Milling Machine Company. Mr. Huffman spoke on "Cutter Sharpening Practice."

Officers for the present term were sworn in by Mr. Burnside. They included W. W. Mason, chairman; A. J. Mirick, 1st vice chairman; W. L. Smith, 2nd vice chairman; W. H. Lebo, secretary; and L. E. Campbell, treasurer.

Louisville. Members attending the January 12th meeting at the Kentucky Hotel heard Mr. H. M. Huffman, field engineer of the Cincinnati Milling & Grinding Machines, Inc. of Cincinnati, give a talk on the grinding and servicing of machine tools.

John Thomas, treasurer, appointed Mr. Charles Hicks, Mr. Charles Garvey, Mr. J. Junkin, Mr. John E. Paskey and Mr. Ray Doninger as a nominating committee for the election of officers.

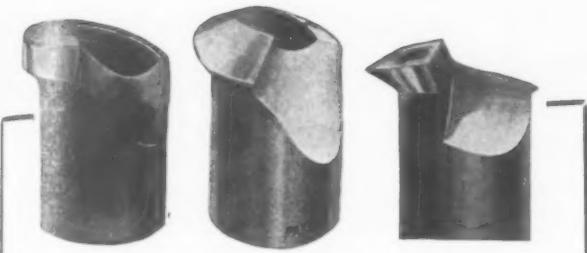
Milwaukee. The regular monthly dinner meeting was held February 11th at the Republican House and included a talk by Mr. E. H. Johnson, president of the Johnson Tool and Engineering Company of Dayton, Ohio and consultant of the War Conversion Board at Washington. Preceding his lecture, Mr. Johnson showed a film from the War Conversion Board which expressed the vital necessity of conserving essential war material.

Election of Chapter officers was held at this meeting with the following results: Paul Wernecke, chairman; Foster Kuehn, 1st vice chairman; Paul Butzen, 2nd vice chairman; Roland Nauertz, treasurer; and Ernst L. Collin, secretary.

Minneapolis-St. Paul (Twin Cities). About 50 members and guests were present at the January 20th meeting which was held in the Coffman Memorial Union. The speaker of the evening was Lt. G. B. Fall of the Army Air Forces who explained crime detection through fingerprint reading. A steak dinner and a short business session with Chairman Francis E. Gruber presiding, preceded the meeting.

(Continued on page 204)

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- Free cutting action always retained
- Tools stand greater feed
- Increased feed will not shatter tool

The angle of the cutting edge and the special helical backed-off form of the front of tool produce a free-cutting action unaffected by resharpening.

The greatest cutting force is always directed toward the largest cross section of the cutting tool, which enables tool

to accept much more feed than is possible with any other boring tools.

Since the angle at which the tool removes material is not at right angles to the stock, a smoother bore, true to size, is always produced.

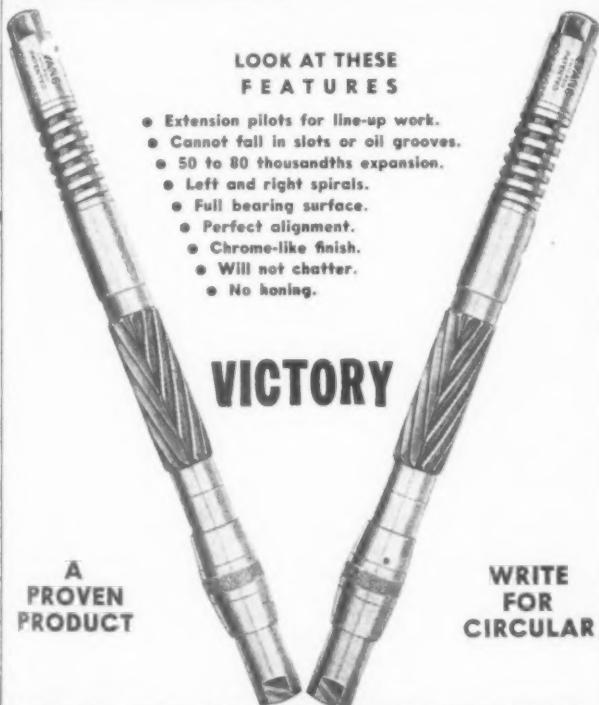
These are shown in catalog A-1139. For carbide tipped tools ask for catalog A-398.



BOKUM TOOL CO.

14775 Wildemere Ave., Detroit

EVANS HIGH SPEED STEEL REAMERS



LOOK AT THESE FEATURES

- Extension pilots for line-up work.
- Cannot fall in slots or oil grooves.
- 50 to 80 thousandths expansion.
- Left and right spirals.
- Full bearing surface.
- Perfect alignment.
- Chrome-like finish.
- Will not chatter.
- No honing.

A PROVEN PRODUCT

WRITE FOR CIRCULAR

EVANS FLEXIBLE REAMER CORPORATION
4539 Ravenswood Ave., Chicago, Ill.



SPENCER MICROSCOPES for surface finish, imperfections.



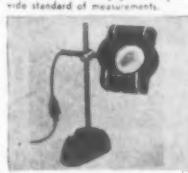
COMPARITOL for checking gages and work to 1/10000.



WILDER PROJECTOR for comparing by means of shadow image.



ULTRA-CHEX — 34 gage blocks provide standard of measurements.



MAGNI-RAY illuminated magnifier for inspection.

FOR PRODUCTION INSPECTION



ACCURATE GAGING

NOT DEPENDENT ON MEASURING SKILL

Today when skilled mechanics and inspectors are difficult to obtain, the use of snap gages for accurate checking of parts is essential. Once set, any operator can tell by the Go and No-Go parts of Atlantic Snap Gages whether the part under inspection has been produced to the correct limits. Faster results are assured.

ATLANTIC GAGES are made in a modern gage plant equipped for the finest grinding and lapping. Castings are of MEEHANITE to assure the maximum in rigidity and accuracy.

Made in the following range of sizes:
Model A—10 frame sizes from 0 to $\frac{1}{2}$ " to $5\frac{1}{4}$ to 6" inclusive.

Model C—19 sizes ranging from 0 to $\frac{1}{4}$ " to $5\frac{5}{16}$ to $5\frac{11}{16}$ ".

Write, wire or telephone CANal 6-3512 for literature and details.

GEORGE SCHERR CO., INC.
132 Lafayette Street New York, N. Y.

HYBCO TAP GRINDERS FOR COMPLETE RE-CONDITIONING OF TAPS

Sharpens
CHAMFER
FLUTES
SPIRAL POINTS

INCREASE
TAP LIFE
100 TO 1000%

ALL TAPS HELD
BY SHANK—CAN
BE SHARPENED
AFTER CENTER IS
DESTROYED



Capacities up to $1\frac{1}{2}$ " hand taps—2 to 10 flutes—right and left hand—available by selection of proper heads. Bench, floor and floor exhaust models.

Write for catalog

HENRY P. BOGGIS & COMPANY
1279 W. 3rd Street Cleveland, Ohio

Francis E. Gruber was elected chairman at the February 17 meeting held at the Coffman Memorial Union. Others elected included Wm. E. Boker, 1st vice chairman; W. A. Alberg, 2nd vice chairman; and W. H. Erskine, secretary and treasurer.

Moline (Tri-Cities). Mr. F. J. Siebenmann, of the John Deere Plow Works, was elected 1943 chairman at the February dinner meeting at the Blackhawk Hotel. Other officers chosen for the year were: T. L. Ramsey, 1st vice-chairman; L. J. Rodgers, 2nd vice-chairman; H. W. Nelson, secretary; and M. E. Polhemus, treasurer.

Mr. A. L. Weller of the Farval Corporation of Cleveland spoke on "Centralized Lubrication in the War Effort." A film on lubrication, edited by the U. S. Bureau of Mines in co-operation with the Sinclair Refining Company, illustrated the principle on which all lubricating agents work to overcome the destruction of moving parts caused by friction.

New Haven. Speaker at the February 4 meeting, held at the Garde Hotel, was Mr. Roy Persell. His lecture was entitled "Principles of Patent Law As Applied to the Tool Engineer."

New Chapter officers elected at the

meeting included Fred J. Rawless, chairman; Henry F. Hoffman, vice-chairman; M. J. Weldon, secretary; and Frank Shute, treasurer.

Northern New Jersey. A special "Executives Night" program was the main feature of the January 12th meeting which was held at the Hotel Robert Treat. Principal guest of the evening was Mr. M. B. Gordon, vice president and general manager of the Wright Aeronautical Corporation. Mr. Gordon spoke briefly on the "Miracle of Production."

Mr. Ray Morris, 1st national vice-president of the Society was among the other guests who spoke at this meeting. Mr. John Gertule and Mr. H. D. Hall were elected as a nominating committee for the election of officers.

Peoria. This Chapter was host to nearly 500 members of the Peoria Engineering Council on February 9th when Mr. John H. Van Deventer, Editor and President of Iron Age Magazine, spoke on "Winning the War and the Peace on the Engineering Front." Dinner was served in the Pere Marquette Hotel. Mr. Harmon S. Eberhard, vice-president of Caterpillar Tractor Company acted as toastmaster.

Election of officers for 1943-44 was held on February 2nd at a business meeting in the Hotel Endres. Those elected were: V. W. Joslin, chairman; C. B. Hartsock, vice chairman; Stanley Aldred, 2nd vice chairman; Herman Krei, secretary; and Charles Lipp, treasurer.

Philadelphia. "Tooling for Production with Plastics by Formite Method" was the subject of a talk given by Mr. Joseph S. Pecker, President of Machine & Tool Designing Company, at the January meeting of the Philadelphia Chapter. This meeting was held at the Engineers' Club at Philadelphia on January 21st.

Pittsburgh. 76 members attended the dinner and 99 attended the technical session of the February 5th meeting which was held at the Fort Pitt Hotel.

Following the annual election of Chapter officers, a talk was given by Mr. Fred W. Hammer of Warner & Swasey Company. Mr. Hammer showed a film on the action of metal cutting tools.

Racine. Two films were shown at this Chapter meeting on the construction of airplanes. They showed the building and mass production of the Boeing bomber and the P. B. Y. from the sub-assembly of small parts to the assembly of large sections.

Rochester. The February 10th meeting, held at the Hotel Sagamore, featured the election of chapter officers for 1943. Election returns were as follows: Joseph H. Schick, chairman; Chauncey G. Newton, 1st vice chairman; Joe S. Gray, 2nd vice chairman; Charles E. Seely, 3rd vice chairman; Milton L. Roessel, secretary; and Fred E. Bittner, treasurer.

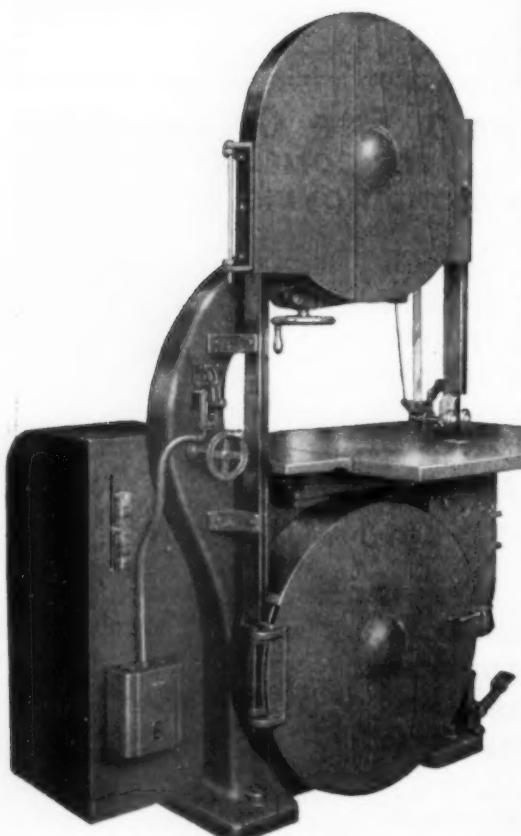
New members of the board of directors included James Noble, William Gordon, Robert Barnett, James Breslin, and Charles Franklin.

(Continued on page 206)

THE TOOL ENGINEER

Tanneewitz VARIABLE SPEED BAND SAWS

Instantly adjustable to the IDEAL Speed for cutting Metal of EACH and EVERY Type!



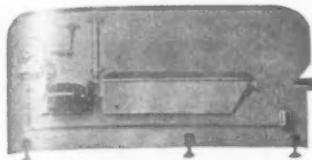
- In cutting off gates and risers from castings of various metals, practically any size, in cutting steel sheets up to $\frac{1}{4}$ -inch thick, cast iron, plastics or any one of dozens of other cutting operations, a TANNEWITZ Variable Speed Metal Cutting Band Saw will do it quicker, better, and show a handsome return on the investment involved.

There are five new models in addition to our regular High Speed Band Saws, including those which handle work as wide as 52 inches, and those with 48-inch clearance beneath the guide. Get a line on the TANNEWITZ metal cutting band saw that fits your particular needs. It will save time, step up production and repay its cost dozens of times. Write for full particulars NOW!

Made by Sawing Machinery Specialists

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

METAL PARTS CLEANING Low Cost — Efficient



for

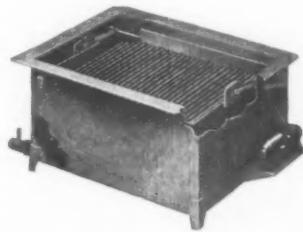
CONTINUOUS Large Scale PRODUCTION

...the STURDY-BILT "Soaker-Hydro" CLEANER

Combines long "SOAKING-PROCESS" plus Hydro washing Action for large production. Parts are loaded onto trays, passed through the soaking tank — then are rinsed to remove oil film and clinging chips — then subjected to a power wash. They are removed dry and ready for use or for the next manufacturing operation. Simplicity is the keynote of construction as well as operation. Send for complete details.

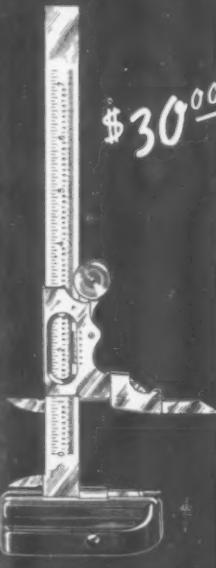
"SIMPLEX" Metal Parts CLEANER

This small, compact, automatic and mechanically simple unit combines the two most positive methods of cleaning Metal Parts, Assemblies, Shells, Cartridges, Castings, Stampings, etc. A swishing action positively removes all grease, oil, dirt and metal chips that have been loosened during the "chemical action" of the "soak". Can be installed in different departments or in a series — one unit for cleaning, another for rinsing or rust prevention coating and others for special requirements. Send for "Simplex" bulletin for complete details.



STURDY-BILT EQUIPMENT CORP.
Department T-3
WEST ALLIS, WISCONSIN

Precision Gauges



Mechanics will welcome the introduction of the PAL Precision Gauge, with improved feature of close adjustment. The PAL Precision Gauge is a dependable and handy measuring tool and is offered at a very reasonable price. The PAL Precision Gauge is 10 1/4 inches in height, has a full 6 5/8 inch range. It can be converted from a calibre to a height gauge in ten seconds, and has direct reading inside and outside.

The PAL Precision Gauge has many new features, including the following:—Plastic base, making it lighter and rust proof; cast iron sole plate for longer wear; detachable scriber; swift motion assembler which eliminates all thumb screws; self-locking sensitive adjustment.

PAL TOOL COMPANY

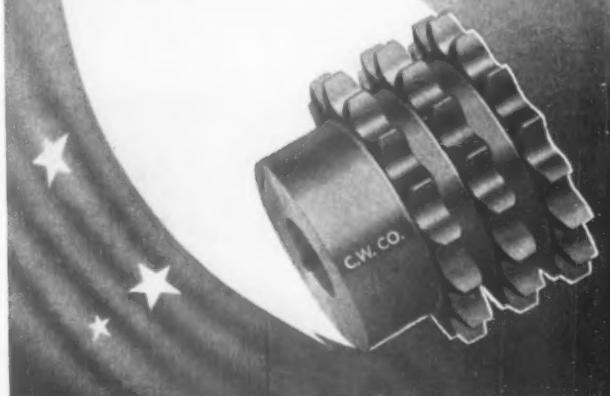
2800 EAST THIRTY-FIRST STREET MINNEAPOLIS, MINNESOTA

For RUSH War Jobs Order Cullman Sprockets

More than 50,000 Cullman Sprockets are available from stock for immediate delivery.

Because of specialized equipment and experience, Cullman Sprockets can be made to your specifications in a relatively short time, and at minimum cost.

Write, telephone, or wire Cullman on any sprocket requirements.

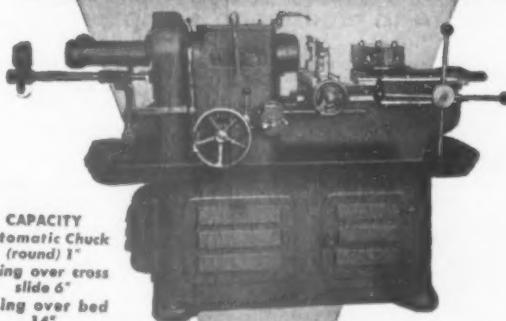


CULLMAN WHEEL COMPANY
1352-R ALTGELD STREET CHICAGO, ILLINOIS

for ECONOMY—for HIGH SPEED PRODUCTION

The MOREY 2G Back-Geared TURRET LATHE

Timken Bearing
Self-Locking Turret and Infinite Spindle Speeds



CAPACITY
Automatic Chuck
(round) 1"
Swing over cross
slide 6"
Swing over bed
14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown by through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools—Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

Ask for Circular 629 for full details

MOREY MACHINERY CO., INC.

410 BROOME STREET • NEW YORK, N. Y.

A. S. T. E. DOINGS

While the tellers were counting the ballots, members were entertained with Bell Aircraft's sound film "Cannon on Wings." Pictures taken by Frank O'Brien of picnics during the past three years were also shown.

Rockford. Election of officers for this Chapter took place on February 4th in the Crystal Room of Hotel Nelson. Leo Reuland, was elected as chairman, Fred Swanson as 1st vice chairman, Walter Lustig as 2nd vice chairman, Don Hawkinson, 3rd vice chairman, Ernie Seborg as treasurer, and Ernst Norrman as secretary.

Past chairman pins were presented

to Ed Dickett, H. F. Reuhl, Ken Lund and Geo. Johnson. Movies were shown after presentation of pins and the election, followed by a buffet lunch and entertainment.

St. Louis. The Hotel Melbourne on February 4th was the scene of the election of Chapter officers for the year. Those elected were Ernst Nieman, chairman; William Mueller, 1st vice chairman; Ralph Mueller, 2nd vice chairman; Otto Deubel, secretary; and Walter Schwartzkopf, treasurer.

Mr. H. M. Huffman, field engineer, Cincinnati Milling Machine Company, presented an illustrated lecture on

"Cutter Sharpening Practice."

The St. Louis Chapter has challenged the new Chapter at Kansas City to compete against them in a "Quiz of Two Cities Program" to be held on Sunday evening, March 7, at 9:30 P. M. over Radio Stations KMOX and WDAF.



Left to Right: Ed Dickett, H. F. Reuhl, Ken Lund, and George Johnson were presented past chairman pins by Chairman Reuland at the recent Rockford meeting.

San Francisco (Golden Gate). A sound motion picture, entitled "Jewels of Industry," was shown at the January 19th meeting which was held at the Engineers' Club of San Francisco. The film was furnished by the Carborundum Company and comments were made by Mr. R. DeRoche of that concern.

Members of this Chapter who are on the nominating committee for the chapter officer elections include D. M. Grimm, L. P. Martin, Frank Berck, Walter Gustafson and Mr. H. H. Hagedorn. Mr. Grimm is chairman of the committee.

San Diego. The January 29 meeting was held at the Park Manor Hotel with 73 in attendance. Introduced at this gathering were Mr. Gosnell who is in charge of tool design at the Naval Air Station and Lt. Snodgrass in charge of the training program.

Two films were shown by Mr. Turner of the Norton Company. William Connell and William Asmus were elected as a nominating committee at this meeting.

Seattle. 50 members and guests were present at the February 9th meeting which was held at Crawford's Sea Grill. Among the guests introduced at this meeting were Mr. Richardson, Keyport Torpedo Station; Mr. Wing, Cleveland Twist Drill Company; and Mr. Howard and Mr. Harmer, Boeing Aircraft Company.

Mr. Metcalf was elected Chapter chairman for 1943-44 at this meeting. Other officers elected at this meeting included Art Means, 1st vice chairman; Mr. Mooradian, 3rd vice chairman; Mr. Clark, secretary; and Mr. Burns, treasurer.

Springfield. Carl G. Rising was elected Chapter chairman for the year 1943-44 at the February 8th meeting which was held at the Highland Hotel. Other officers elected at this meeting included Kenneth Abbe, 1st vice-chairman; Richard S. Brown, 2nd vice chairman;

(Continued on page 208)

THE TOOL ENGINEER

LIMA GEARSHIFT DRIVES

They are engineered for fast, precision production and to increase operator efficiency and accuracy. That is why LIMA Gearshift Drives are playing such an important part in machine tool and production equipment operations today.

Let us tell you how LIMA Gearshift Drives will increase your production. Wire or write us for address of Lima Engineering Service nearest you.

* Buy War Bonds for Quick Victory *



Large enough to successfully serve you, yet small enough to give personal attention to your needs.

DRIP - PROOF
1 to 75 HP

THE LIMA ELECTRIC MOTOR CO. 453 FINDLAY ROAD

LIMA, O. U. S. A.

POLISHING LATHE OPEN VERTICAL TOTALLY-ENCLOSED

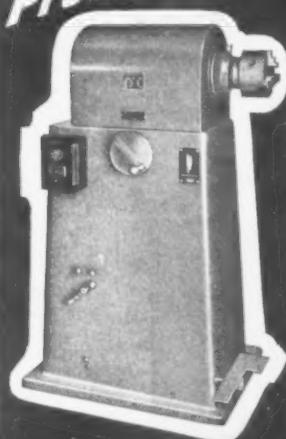
ARE YOU TOOLED for *FASTER* *Production?*

USE SCHAUER
SPEED LATHES

BURRING-LAPPING-POLISHING and FINISHING operations of gears, pinions, pulleys and similar parts.

Used by Pratt & Whitney Aircraft, New Departure Mfg. Co., Winchester Repeating Arms, GMC, Lukas-Harold Corp., Army and Navy Stations and many others.

Write for Catalog No. 420



"the originators of today's Speed Lathes"



SCHAUER MACHINE CO.

2066 READING ROAD

CINCINNATI, OHIO

TRY THIS

MODERN WAY

of holding work to face plate when using the steady rest on a lathe . . .

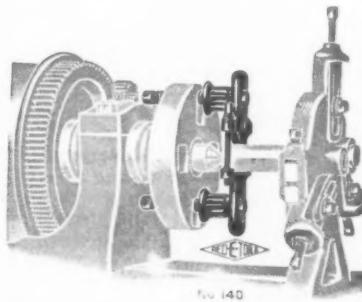


FIG. 140

RED-E FACE PLATE DOGS

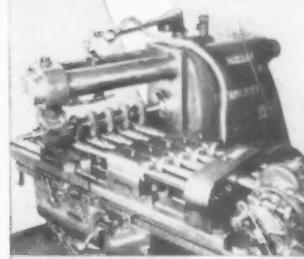
Replace other old methods of holding as by belt lacing or hook bolt. The one shown consists of an adjustable dog or driver and two bolts passing through the face plate. Draws equally.

Write for Catalog E-42

THE READY TOOL COMPANY
585 IRANISTAN AVE.
BRIDGEPORT CONN.

A.C.E. FOR Special CUTTING TOOLS

MANUFACTURED
TO CUSTOMER'S
BLUEPRINTS



A.C.E.'s MODERN METHODS

Above is shown a five spindle indexing fixture for milling spirals—one of A.C.E.'s advanced methods aiming at the goal of precision mass production.

At right—A.C.E.'s MODERN Inspection Methods exemplified by a sine bar specially designed by A.C.E. Engineers to improve inspection of high precision cutting tools.



Have us quote on your special cutting tools—for attractive deliveries and prompt estimates.

AMERICAN CUTTER

AND ENGINEERING CORP., WARREN, MICH.

SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO YOUR PRINTS

CERTAIN TERRITORIES OPEN FOR ACTIVE AGENTS

WRITE FOR NEW ILLUSTRATED BULLETIN

AMERICAN CUTTER & ENGINEERING CORP., 31751 MOUND RD., WARREN, MICH.



We will see that your job is set up with the right
LIVE CENTER—prompt deliveries on high priorities

STURDIMATIC
TOOL COMPANY
5218 THIRD AVE. DETROIT, MICH.

A. S. T. E. DOINGS

Richard S. Carroll, treasurer; and Win-dell T. Ingham, secretary. More than 90 members and guests attended this meeting and heard Mr. V. H. Ericson of The Norton Company talk on "Cutter Sharpening and the Grinding Wheel."

Springfield, Vt. (Twin States). Ernest V. Flanders was elected chairman of the chapter at the February 11 meeting held at The Windsor House in Windsor, Vt. Others elected at this meeting included J. Kenneth Aiken, 1st vice chairman; George H. Pratt, 2nd vice chairman; Ray W. Streeter, secretary; and Prescott R. Lovejoy, treasurer.

Speaker at the technical session was

Herman Zorn, vice president of the V & O Press Company, Inc., Hudson, N. Y. Mr. Zorn gave a talk illustrated with slides on "Presses Geared for Defense."

Syracuse. Speaker at the January 6th meeting, which was held at the Hotel Syracuse was Lester G. Detterbeck of George L. Detterbeck Company. Mr. Detterbeck gave a talk on "Cams and Tools for Automatic Screw Machines." A colored film was shown illustrating the making of cams.

Carl Hoffman and Andrew Dwyre were chosen as a nominating committee to select candidates for Chapter officer elections.

Toronto. Fred Schytte was elected Chapter chairman for 1943-44 at the February 11th meeting. Other officers elected included J. B. McRae as 1st vice chairman, A. L. Scott as 2nd vice chairman, C. Neale as treasurer and J. B. Burk as secretary.

75 members attended this meeting and heard Mr. Tim Buell, Chief Sales Manager of the Sundstrand Machine Company at Rockford, Ill. talk on the methods developed by his company to utilize standard automatics with a minimum of special equipment, for turning 40 mm and 75 mm shell, and certain operations on large shell. It is reported that the Chapter now has about 250 members and that the educational tool engineering course is in full swing.

The January 15th meeting of this Chapter was in the form of a war plant visit to the Government-owned plant of Small Arms Ltd. at Long Branch.

Washington, D. C. (Potomac). 200 members and guests were present at the January 7th meeting held at the Harrington Hotel. The speaker at the technical session was Mr. Harry Crump of the Carboloy Company of Detroit who spoke on cemented carbides and showed moving pictures in connection with his talk.

Also shown at the technical session was a film entitled "The Fourth Kingdom," which was presented by the Bakelite Corporation of New York.

Mr. Dave Lattin and Mr. Redfield were chosen as the Nominating Committee to nominate chapter officers for the coming election.

The election of Chapter officers was held February 4 at the Harrington Hotel. Ernest M. Seifert was elected chairman; Jay C. Reed, 1st vice chairman; E. B. Amidon, 2nd vice chairman; Edward A. Peterson, secretary; and Robert T. Plitt, treasurer.

Wichita. Following dinner at the Hotel Broadview on the night of February 12th, members heard a talk by Mr. E. J. Harwood of Boeing Aircraft Company on "Plastic Tooling." Mr. Harwood's talk was followed by a brief speech by Mr. H. W. McCarter of Boeing Aircraft on "Major Jigs."

J. W. Rix and H. J. Bales were chosen as a nominating committee to select nominees for the coming election of officers.

Worcester. Approximately 100 attended the dinner and meeting of the Worcester Chapter which was held on February 2nd. The election of Chapter officers was held at this meeting.

Mr. H. E. Linsley, Public Relations Division, Wright Aeronautical Corporation, Paterson, New Jersey was the speaker at this meeting. Mr. Linsley told about the manufacture of a Wright 14 Cylinder Cyclone Engine.

Henry W. Wilder was elected chairman; Herman G. Libby, 1st vice chairman; Harold D. Stake, 2nd vice chairman; F. William McQueston, treasurer; and Harvey M. Allison, secretary.

CHIPS FROM A. S. T. E. NATIONAL HEADQUARTERS

Perhaps the smile of Miss Frances M. Gerken plays a part in the rapid reduction of the list of delinquents for it is she who is responsible for the preparation of the monthly list.

(Continued on page 210)

THE TOOL ENGINEER

**TIPPED WITH
TUNGSTEN CARBIDE**

THESE LATHE CENTERS LAST 50 TO 100 TIMES LONGER

The tip of these precisely ground lathe and grinding centers are made of Tamaloy tungsten carbide which is 50 to 100 times more resistant to wear and galling than high speed steel. By using these centers you will cut down your replacement costs and greatly improve the accuracy of your machines.

STANDARD CENTERS

No. 1 Morse Taper.....	each \$3
No. 2 Morse Taper.....	each \$5
No. 5 Morse Taper.....	each \$18

Prices on Brown & Sharpe, Jarno and special centers on request.

Bulletins on Request

GET TUNGSTEN ALLOY'S PRICES ON THESE PRODUCTS—

Tamaloy carbide tips • tipped tools • tipped lathe centers
tipped drills • gages • Speedaloy tool bits

TUNGSTEN ALLOY MFG. CO. • 65 GOLDEN ST., NEWARK, N.J.
Formerly Circle Tip Tool Co.

TUNGSTEN CARBIDE SPECIALISTS

Use Them Over and Over



DE-STA-CO ARBOR SPACERS

Measured by the number of times they can be used, De-Sta-Co Spacers are the lowest in cost of any spacers you can buy. Made of metal, they are not affected by oil or heat. Use these spacers for quick set-up of milling machine cutters and wherever low cost, accurate spacing is required.

Stock sizes .001" to .125" thick. Specials, any length, cut from bar stock, ground to decimal.

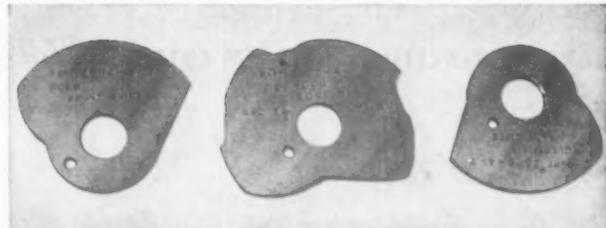
TRIAL ASSORTMENT—enough for average use on one machine sent for \$1.00. Give arbor size. Size and price list sent FREE!

DETROIT STAMPING CO.
Established Over 25 years
356 Midland Ave • Detroit, Mich.

GET QUICK DELIVERIES ON



FRAY TOOL & REAMER CO.
a subsidiary of
Fray Machine Tool Co., Inc.
505 W. Windsor Road, Glendale, Calif.



SCREW MACHINE CAMS for B & S MACHINES

Cams cut to your layout shipped within 2 to 3 days.

Set of 3 No. 00 Cams including blanks, cutting, heat treating — \$6.20 complete. Other sizes in proportion.

GEORGE L. DETTERBECK CO.
1871 CLYBOURN AVENUE
CHICAGO, ILL.

Send for Valuable Booklet

Forgings For All Industries
Rough Turned or Finished Complete



Composite Die Sections
Extrusion Tools
Crankshaft Forgings
Gear Forgings
Die Casting Dies

Rings, Discs, Blocks,
Shafts, Hubs, Bars,
and Special Shapes.
Tool Steel of all
Makes

S.A.E. and N.E.
SPECIFICATIONS
Stainless &
Copper Forgings
May we Serve You?

AJAX STEEL & FORGE Co.
205 ADAIR STREET
DETROIT, MICHIGAN



WARTIME, PEACETIME—KEEP 'EM CUTTING *The Wells Way!*



Wells Saws
THE SIGN OF SERVICE

WELLS No. 8

SPECIFICATIONS

WELLS No. 8

Capacity: Rectangle.....8" x 16"
(spec. bowed guides)... 5" x 24"
Rounds 8" dia.
Speeds: ft. per min. 60, 90, 130
Motor Specifications optional

WELLS No. 5

Capacity: Rectangle... 5" x 10"
(spec bowed guides)
Rounds 5" dia.
Speeds: ft. per min. 60, 90, 130
Motor Specifications optional

THE SAW WITH THOUSANDS OF FRIENDS IN INDUSTRY!

A fast and accurate metal cut-off saw able to handle most all types of metals in various shapes and forms as applied to industry. It wanted a versatile, simple unit for odd jobs or production work. The Wells No. 8 was the answer — and that is why so many plants, large and small, have Wells Saws.

Today's war production program and tomorrow's peace-time competition will emphasize the advantages Wells Engineers have built into their products. If you have metal cutting problems look for the answer in a Wells. Call your distributor or write direct.

Wells Has Established Leadership

*Wells Has
Established
Leadership*

WELLS MANUFACTURING CORPORATION
Wells METAL CUTTING
BAND SAWS
1212 MONROE ST. • THREE RIVERS, MICHIGAN

—A. S. T. E. DOINGS—

tion of all delinquent lists. She also posts and mails all roster sheets of newly elected members to Chapter Secretaries. This is only the major part of her job but a most important one, so — Meet Miss Frances M. Gerken.



Bramson Publishing Company Photo

FRANCES M. GERKEN
Handles A.S.T.E. delinquent list.

While we are on the subject of delinquents, it is probably well to remind Chapter Chairmen that each was sent a list of the delinquents in his Chapter on January 29th, by National Secretary Clyde L. Hause. The letter which accompanied the list pointed out that the Constitution and By Laws provide that "IF DUES SHALL REMAIN UNPAID FOR A PERIOD OF FOUR MONTHS FROM THE BEGINNING OF THE FISCAL YEAR (JANUARY 1st) THE MEMBER SHALL BE CONSIDERED AS UNDER SUSPENSION AND SHALL FORFEIT HIS RIGHT TO VOTE AND TO RECEIVE THE PUBLICATION OF THE SOCIETY (THE TOOL ENGINEER). SHOULD THE RIGHT TO VOTE BE QUESTIONED, THE BOOKS OF THE SOCIETY SHALL BE CONCLUSIVE EVIDENCE." Several Chapters have done great work in clearing delinquencies from their lists. As of February 18, there were less than a thousand members who have not yet paid their dues for 1942. Nearly 5000 have already paid their dues for 1943.



Chapter Chairman Pins

As rapidly as arrangements can be made, each Chapter Chairman is being presented with his Chapter Chairman pin. This remains the property of the Chapter to be passed along to his successors. These Chapter Chairman pins are paid for from National funds upon action by the Board of Directors at the October meeting in Springfield. Similar pins, having two diamonds instead of two rubies and bearing the words "Past Chairman" instead of "Chairman" are, by the same action of the Board, made available at cost for purchase by Chapters for presentation to retiring chairmen.

(Continued on page 212)



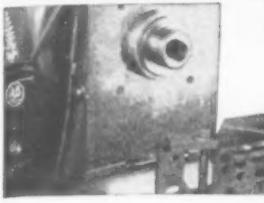
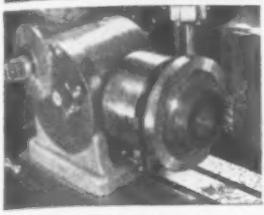
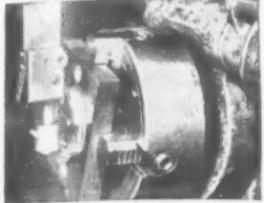
4 of the many ways SLOTMMASTER can be used to save TOOLS & SETUPS

Left: Set-up for cutting a spline.
Below: Set-up for cutting an internal gear.

SLOTMASTER can be used on any round or flat-on-round overarm milling machine and will do precision work that normally requires a multi-thousand dollar machine. (All working parts are of tool steel heat treated and ground to close tolerances). It takes but little time to change over from one head to the other . . . the stroke of the ram is adjustable from 0 to 4" . . . the speeds range from 50 to 250 S.P.M. The tool holder is of the clapper box type and can be turned in any position. SLOTMMASTER comes complete with pull-motor, mounting bracket, etc. . . . Send for a 4 page catalog—give specifications of the milling machines you wish to equip.

Immediate deliveries on high priorities.

EXPERIMENTAL TOOL & DIE CO.
12601 Greiner
Detroit, Mich.



Below: Conventional set-up on a round overarm milling machine shows the set-up for cutting a feed cam.



BLADES FOR CENTERLESS GRINDERS
... TIPPED WITH TUNGSTEN CARBIDE

Assure Greater Production and Accuracy in the finish
grinding of bullet cores, armor-piercing shot, shells,
projectiles, tank parts, aircraft engine parts, rifle
and machine gun parts.

METAL CARBIDES CORPORATION
YOUNGSTOWN, OHIO

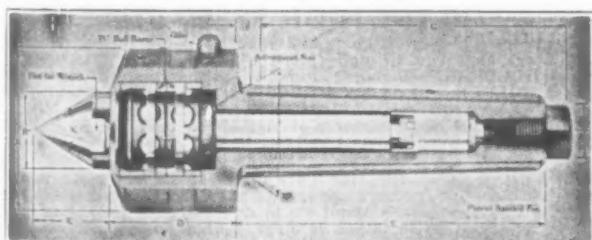
The Improved Nielsen Live Centers

LOAD CAPACITY—200 TO 40,000 LBS.
AT 100 RPM.

HAVE ADJUSTMENT TO TAKE UP WEAR
AND PRELOAD BEARINGS

STANDARD MORSE TAPER No. 2 TO 6
IN STOCK

Write For Catalogue



NIELSEN, INCORPORATED

LAWTON, MICHIGAN

MARCH, 1943

ARE YOU LOOKING FOR MANUFACTURING AND DISTRIBUTING FACILITIES?

Here's an opportunity. A well-rated manufacturing firm is open to negotiate with anyone having a product to market. It has facilities to produce on production basis any sort of article intended for the machine tool industry—stampings, forgings, or castings—from the blueprint to the finished product—including assembling, packing, and shipping.

In addition to the complete manufacturing facilities, this manufacturer has a well-established distributing organization which can be utilized to advantage in marketing any product going to the same industrial field.

While this manufacturer prefers to consider products that are protected by patent, he will be glad to view any others, even though they are partially developed. Any items submitted without patent protection will be accepted with sender's responsibility and will be considered with due confidence until terms of disposition have been mutually agreed upon.

**WRITE BOX 762
THE TOOL ENGINEER**

How GUSHER COOLANT PUMPS SPEED Production



A Gusher Pump delivers coolant exactly when you want it for honing, milling, grinding, cutting, tapping and threading . . . from a dribble to 200 g. p. m. No lost time . . . no bottleneck in production.

Simple design makes for efficient, dependable and trouble-free operation. Many patented and exclusive advantages no other pump can offer. The leading machine tool manufacturers use Gusher Coolant Pumps. Include Gusher Pumps in your specifications. Write for data.

MODEL 5-P3
There's a large mounting flange on this new model, so as to make it interchangeable with larger Gusher Pumps. Right or left discharge. 1/10 H.P. Maximum Capacity: 10 g. p. m.

L THE RUTHMAN MACHINERY CO.
1815 READING ROAD CINCINNATI, OHIO
LARGEST EXCLUSIVE BUILDERS OF COOLANT PUMPS J

More Efficient Tapping with UNSKILLED LABOR!

Made Possible By Special Compensating Springs

Production men all over the country report that Procunier Tapping Machines are enabling them to get more accurate tapping faster with less tap breakage—despite the shortage of skilled labor. Girls help and women war workers are producing like experts on these machines. Here's why: The extra-long spiral compensating springs, with wide range of hand screw adjustments, maintain pre-set tap feeding and reversing pressure INDEPENDENT OF OPERATOR! Other Procunier features that step up your tapping output are:

1. The improved Procunier tapping head with double-cone cork-face friction clutch;
2. Four speeds, ranging from 390 to 2050 RPM efficiently handle jobs for which conventional high speed tapping machines are inadequate;
3. One machine handles tap sizes from No. 2 to $\frac{1}{2}$ " through two interchangeable heads.

TAP ESTABLISHES ITS OWN LEAD

The new Procunier Universal Tapping Machine is exclusively designed so that it actually allows the tap to establish its own lead. There is nothing more accurate than a precision ground thread tap as a guide for tapping—so maximum tapping efficiency is attained where an accurate tap is free to establish its own lead in cutting the thread.

SEND FOR BULLETIN giving full details, description and prices on the full line of Procunier Universal Tapping Machines.

PROCUNIER

SAFETY CHUCK CO., 12-18 S. Clinton, CHICAGO, ILL.

PROCUНИER SAFETY CHUCK COMPANY
12-18 S. Clinton, Chicago, Ill.

Bend me bulletins on: High Speed Tapping Heads Tru-Grip Tap Holders Universal Tapping Machines.

Name.....
Address.....
City..... State.....



A. S. T. E. DOINGS

W. B. Peirce, National Chairman of the Membership Committee, has made a name for himself as a public speaker. He has (according to newspaper clippings received at the National Office) made personal appearances before the Fairfield County Chapter (Bridgeport, Conn.) and his own (Pittsburgh) and delivered a most interesting talk on "Stay-bolts to Gun Barrels."

John Gaillard of the American Standards Association was a visitor to Headquarters on February 5th — discussed future cooperation between ASA and ASTE. Very encouraging.

The 1943 War Production Edition of the Machine and Tool Progress Exhibition space is sold out as this is written. It reads like a Horatio Alger story of success. Here it is: January 26, mailed announcements of the Exhibit to 1941 exhibitors—February 1, assigned spaces as requested in order of receipt of reservations—85 booths assigned or 59% of space sold. February 20, last unit sold and it is apparent that the 1943 Annual Meeting in Milwaukee will have an exhibit of excellent scope bringing to those who attend, the newest equipment, processes and services to hasten and simplify the production of war materiel.

During January, 1943, 500 address changes of members were registered at the national office. They are still coming.

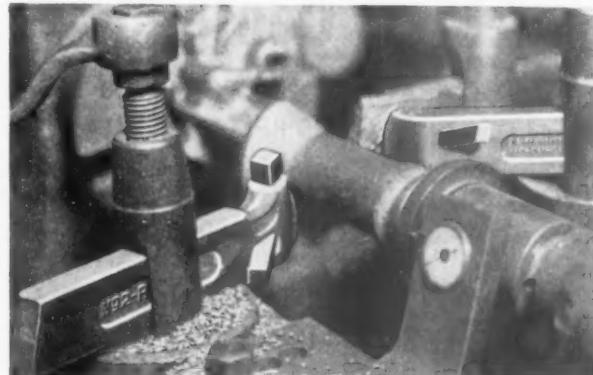
As of February 20, 1943, the total membership of ASTE was 12,190.

The following, quoted from the February 4, 1943, meeting notice of Potomac Chapter, is proffered as a timely definition of TOOL ENGINEERING.

"TOOL ENGINEERING is that phase of production management which controls methods and mechanical equipment required for the modern manufacture of precision, interchangeable parts. Through the proficiency of the TOOL ENGINEER, in devising practical methods, tools and machines, whereby both skilled and unskilled operators can produce a variety of parts from the simplest toys to the most ingenious self-acting machinery, the science of mass production has given us the AMERICAN WAY of LIFE which is the keystone of our Victory program."

THE END

ARMSTRONG



DO THE SAME WORK WITH 1/10 THE HIGH SPEED STEEL

Stop wasting critical High Speed Steel by using forged tools for that work that can be done more efficiently with ARMSTRONG TOOL HOLDERS. Each ounce of high speed steel in an ARMSTRONG TOOL HOLDER will do the work of 10 ounces in a bar tool. With single ARMSTRONG TOOL HOLDERS replacing complete sets of forged tools, the large amounts of high speed steel tied up in cumbersome single-purpose solid tools or wasted in heavy tool stumps can be saved.

ARMSTRONG TOOL HOLDERS are the most efficient tools obtainable, with correct cutting angles, maximum tool clearance, extreme rigidity and strength to stand up to any speed or feed. Use them for every operation on lathes, planers, slotters and shapers and for many operations on engine lathes, turret lathes and screw machines to "SAVE: All Forging, 70% Grinding and 90% High Speed Steel."



ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"
360 N. Francisco Ave. Chicago, U. S. A.

Eastern Warehouse & Sales:
199 Lafayette St., New York



THE TOOL ENGINEER

GRAHAM MULTI-PURPOSE VISE



With special V-jaws, shell jaws, stops, drill guides, etc., this vise puts a ready-made jig on your drill press, radial, shaper, miller, grinder, planer. Also sold plain, drilled for attachments.

KNURL HOLDER FITTING LATHE TURRET

Using only straight-cut knurls, this tool gives a wide variety of straight, spiral and checkered patterns. Capacity: up to $2\frac{1}{2}$ " dia. of work.

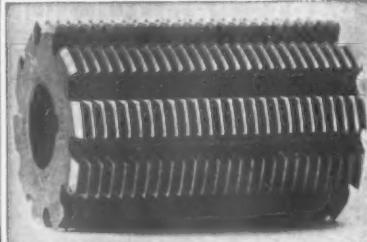


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MULTIPLE THREAD MILLING HOBS



—in any thread system, any thread angle, any thread form. Inch or metric scale. Left or right hand threads. Free from distortion. Up to 7" O.D., and 4" thread length for internal or external threading.

TOLERANCES: CUT ON MACHINES ADJUSTABLE FOR TOLERANCES UP TO 1/10,000

All hobs demagnetized relieving chips immediately.

DELIVERY TIME: FROM 1 WEEK ON

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100 So. 6th Street, Terre Haute, Ind.

For quick action call plant at Clinton, Ind., Telephone 85



C-F POSITIONERS

—the capacity you need—the features you want

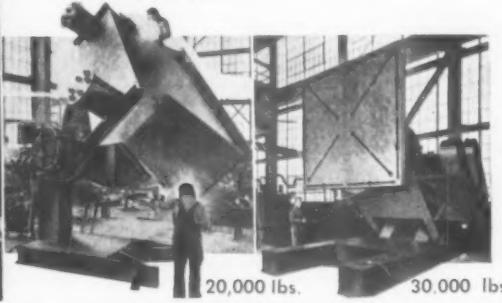
Not only for the welding you are doing today, but for the increased amount of welding you will do in the future, you will want C-F Positioners.

- (1st) Because "position welding" is generally specified now.
- (2nd) Because the C-F Positioner Line provides the exact size and type positioner needed for every shop.
- (3rd) Because C-F Positioners have the special design and operational features which make them universal tools — adjustable height pedestal and boom-type bases that increase tilt and operator and floor clearance; manual, motor or variable speed controls, greater capacity for rating etc.—features that assure efficient handling not only of today's job but of tomorrow's as well.

CULLEN - FRIESTEDT CO.

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Bulletin
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Calling for Precision of

DUB LIFE
REVERSIBLE
PLUG GAGES

DUBLIFE
UNITED PRECISION PRODUCTS CO.
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PATENTS PENDING

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Precision dependable for longest service is insured by DUBLIFE. A new plug end, either "Go" or "No Go" is ready when used end is worn. Easily reversed. Bronze split collet locks ends in same handle. Sizes: .030 to 1". UPPCO lapped for hardest finish.

Ask for Catalog of Complete line.
Other gages of American Gage Design also shown. Write

UNITED PRECISION PRODUCTS CO.

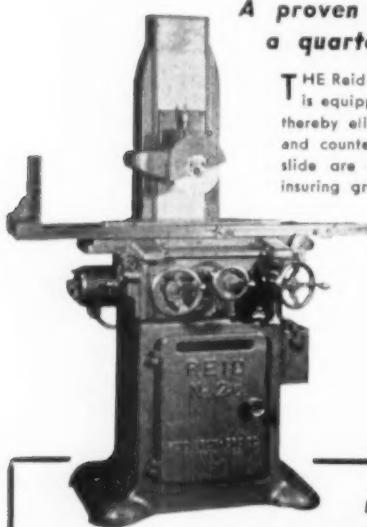
3517 West Belmont Ave.

Chicago, Ill.

THE REID 2B All Electric Automatic and Hand Feed Surface Grinder

A proven product for over a quarter of a century

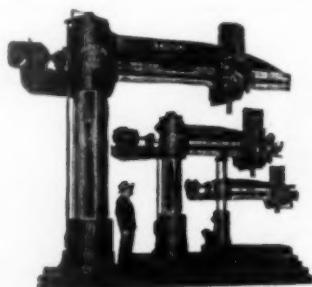
THE Reid All Electric Surface Grinder is equipped with a motorized spindle thereby eliminating all belts, pulleys, and counterweights. Table and cross slide are equipped with oil rollers, insuring greater life and proper lubrication. Table is operated with a silent chain instead of rack and pinion gears. Grinding capacity 6 x 18 x 11. Additional height if required on all standard machines. Send to Dept. O. for descriptive literature.



Exclusive Sales Agents

H. LEACH MACHINERY CO.
387 Charles St., Providence, R. I.

A Reid Distributor in Every Principal City



"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL FEATURES—

- 1—LOW HUNG DRIVE TO THE SPINDLE
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- 4—CONCENTRATED AND CONVENIENT CONTROLS
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THE

CARLTON

MACHINE TOOL COMPANY

CINCINNATI, OHIO, U.S.A.

USE **Stuart's**
SOLVOL
AQUAMIX
Liquid Cutting Compound

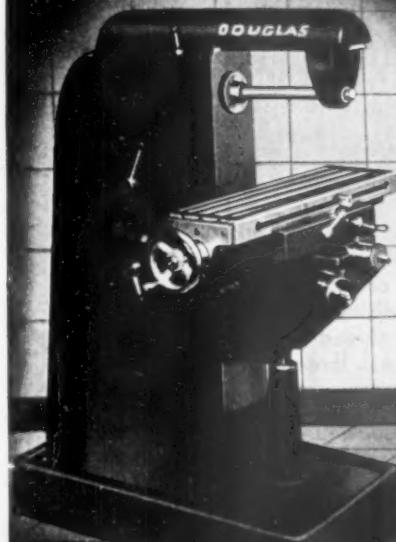
...where operations run "too hot" for properly applied straight cutting oils...

...and where ordinary soluble oils or paste compounds fail to give you satisfactory finish or tool life — USE Solvol! Developed especially for carbide and other high speed tools. Solvol has advantages to offer you in many applications. Put it on the job and watch the improvement.



For All Cutting Fluid Problems
D. A. STUART OIL CO.
Chicago, U.S.A. • LIMITED • Est. 1865
Warehouses in All Principal Metal Working Centers

Douglas 32" X 8"
PLAIN MILLER
FOR SMALL PARTS PRODUCTION



WIDE RANGE OF
SPINDLE SPEEDS
CENTRALIZED
CONTROL

EARLY DELIVERY
BY LARGE SCALE PRODUCTION

DOUGLAS MACHINERY CO. INC.
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NEW YORK, N. Y.

LAPPING COMPOUND

Grade No. 38-900A

A NEW compound with a NEW abrasive sharp enough to lap and polish hardened materials, nitrided, chrome plate, etc. Gages, Dies, Aviation parts—yet fine enough for the final finishing.

This compound has a special heavy oily paste base especially made for dilution with spindle oil, kerosene, sperm, etc.

Hand Plate Machine Lapping

Glass jar samples upon request

United States Products Co.

518 Melwood St.

Pittsburgh, Penna.

*Recommended for use on Norton
Lapping Machines

LESS OPERATIONS
AND FAR
BETTER WORK
WITH A
GATCO

ROTARY PILOT BUSHING

Pilot bushing fits with a PUSH fit,
therefore a perfect bore

ROUND-CHATTERLESS-
SMOOTH

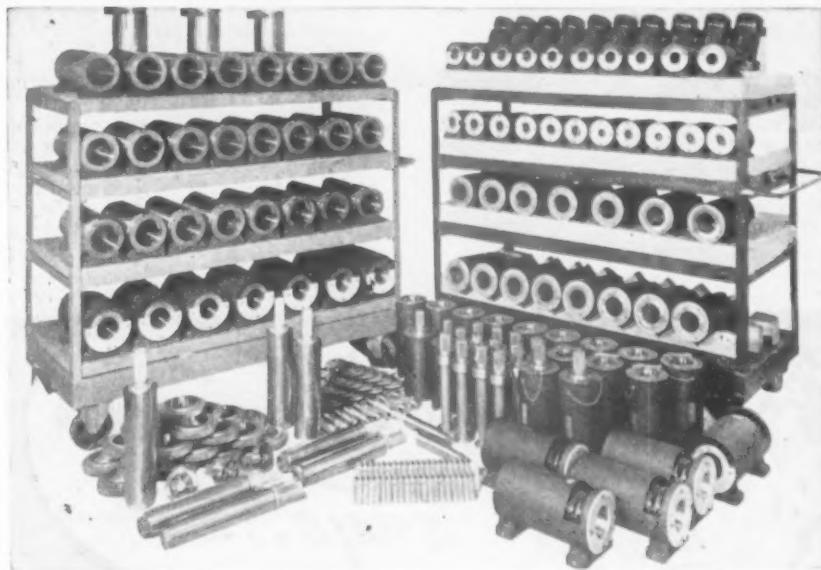


GATCO Rotary jig and pilot bushing is built for core drilling, diamond boring, turret tool piloting, piloting hollow mills, line reaming, carbide boring, spot facing, etc.

Write for full information and prices

GIERN & ANHOLT TOOL COMPANY
1312 Mt. Elliott Avenue, Detroit, Michigan

COMPLETE GAGING SYSTEMS FOR CARTRIDGE CASE INSPECTION



All sizes from 30 caliber to System Includes:

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NEW GAGES

GAGE INSPECTION SERVICE

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Write for prices and full details
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INDIANAPOLIS, INDIANA
LINCOLN 1988—LINCOLN 1968

QUALITY TOOL & DIE CO.

"Ceiling on Grades-
Not Quality"

"THE BIG 3"
HIGH SPEED STEELS

★ BONDED CARBIDE (18-4-1½-10 TYPE)

SUPER COBALT HIGH SPEED STEEL

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STANDARD TUNGSTEN HIGH SPEED STEEL

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TUNGSTEN MOLYBDENUM HIGH SPEED STEEL

WRITE FOR LITERATURE

BRAEBURN ALLOY STEEL CORP.

BRAEBURN, PENNSYLVANIA

THE PASSING PARADE *

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

*T.M. REG. U.S. PAT. OFF.

Otto W. Winter has been appointed president and works manager of Sav-Way Industries, Detroit. Winter, national president of the American Society of Tool Engineers, is also a member of the American Society of Mechanical Engineers, American Society for Metals, American Society of Welding

Engineers and Society of American Military Engineers.

Prior to his position as vice-president in charge of manufacturing of The Republic Drill & Tool Company, Chicago, Winter was factory manager, consulting engineer and sales engineer for several well-known middle-western

firms. He was at one time in Russia as consultant engineer to the Soviet Machine Tool Trust and Cutting Tool Trust.



O. W. WINTER
Now with Detroit firm.

Jos. J. Jilbert, for 20 years superintendent of the Mattison Machine Works of Rockford, Illinois and for the past four years machine shop superintendent of Ampco Metal, Inc. of Milwaukee is now with the Stokerunit Corporation of Milwaukee.

Jack Sandler has joined the staff of Aircraft Parts Development Corporation of Summit, New Jersey as chief plastic engineer.

W. I. Gladfelter was made vice president in charge of operations it was recently announced by a board of directors' meeting of the Crown Can Company.

E. N. Twogood has been appointed engineer of the Gear Department of General Electric's Lynn Works it was recently announced. He succeeds Mr. A. A. Ross, who is retiring after 48 years of service with the company.

Holly M. Olson and Vern H. Bathrick have been promoted to chief mechanical engineer and assistant chief mechanical engineer respectively over all divisions of the Sealed Power Corporation at Muskegon, Mich.

Dr. G. M. Butler has been appointed chief metallurgist in charge of technical control at the Dunkirk, New York plant of the Allegheny Ludlum Steel Corporation.

Lincoln R. Scafe, vice-president and general manager of the Glenn L. Martin-Nebraska Company, will return to the Glenn L. Martin Company at Baltimore and G. Tom Willey, former inspection manager at Baltimore, will succeed him.

John M. Davies, with the research division of The B. F. Goodrich Company since 1926, has been named director of physical research.

F. B. Lounsberry, vice president in charge of manufacturing for all plants of the Allegheny Ludlum Steel Corp.

(Continued on page 218)

THE TOOL ENGINEER



You'll do more work, better quality work, in less time, if you select the proper tool for the job at hand . . . and, after PICKING THE RIGHT TOOL, YOU KEEP IT IN CONDITION and USE IT CAREFULLY AND INTELLIGENTLY. Then, feel secure that you're doing your part in helping produce to whip the Axis.

Let us help you select the right tap for your job.

FROM CUSTOMERS' BLUEPRINTS WE QUITE FREQUENTLY MAKE RECOMMENDATIONS FOR



"THE RIGHT TAP AT THE RIGHT TIME"
The Wood & Spencer Company
Cleveland, Ohio

WITH OUR HOBART
ARC WELDERS WE'RE
READY FOR ANY KIND OF
POST-WAR COMPETITION.

Their charts are the most valuable tools we've added during this war. They allowed us to make all kinds of shortcuts; set amazing production records, and to improve our products for Uncle Sam. After the war our old customers are going to be the ones to profit from our good fortune, so we're mighty proud to have these welders on our side.

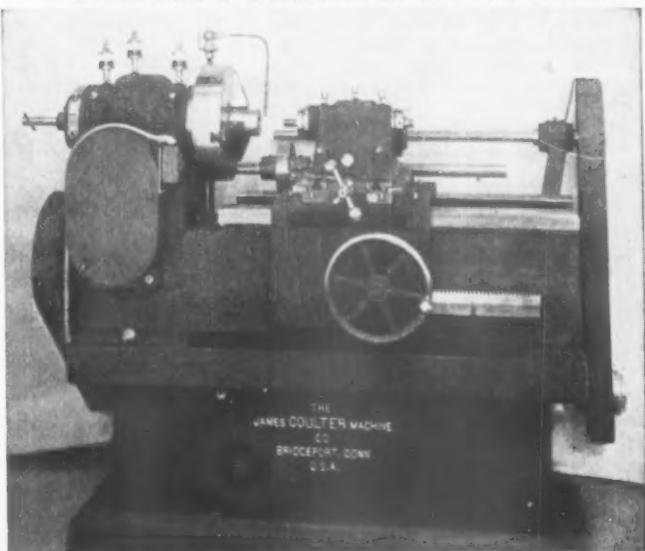
HOBART BROS. CO.

Box TE-33 Troy Ohio



516 Pages: Fully Illustrated "PRACTICAL ARC WELDING". The Ideal Reference Manual for Engineer, Shop Superintendent, or operator. Deals with latest methods and procedures. Shows you "how to do it" for every welding position, metal, and joint. Worth many times its low cost. 5 days free examination. Sent C.O.D. (plus postage) or postpaid if check enclosed. \$2.00 Postpaid

PRECISION THREAD MILLER FULL AUTOMATIC CONTROL

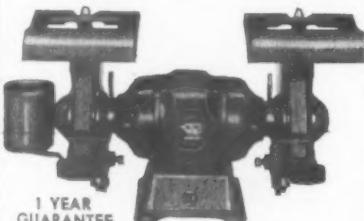


INTERNAL OR EXTERNAL RIGHT OR LEFT — UP TO 7 INCH DIAMETERS
COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U.S.A.

BALDOR BALL BEARING GRINDERS

built for Heavy Duty



1 YEAR
GUARANTEE

ASK FOR BULLETIN 307
ON THE COMPLETE LINE

BALDOR GRINDER No. 724, De Luxe type, built to withstand heavy production service. Has separate combination lights and eyeshields; tool rests are tiltable and adjustable to end from wheel up and down; water pot; $\frac{1}{2}$ HP. motor, 3400 r.p.m., 60 cy. 7" x 1 $\frac{1}{2}$. Aloxite wheels made by Carborundum Company. Price without bulbs, \$49.50

BALDOR ELECTRIC COMPANY
4335 Duncan Ave., St. Louis, Mo.

BUILT BY MOTOR SPECIALISTS

HELP FOR AIRCRAFT
MANUFACTURERS

Template Duplicating Service



Contact Method, Guaranteed Accuracy

STYLE 1.

Dark blue lines indented on light grey permanent surface. Will not chip. Lines and surface cannot be rubbed or worn off. Send for sample.

STYLE 2.

Etched lines on dark blue permanent surface. This and Style 1 more durable than duplicates made by other methods. Sample on request.

Template duplications made by our contact duplicating method, on 18 gauge auto body steel. Drawing lines and details etched or indented on practically indestructible surface. Will stand hardest shop wear and abuse. We duplicate accurately from scribed master templates, photoprints, photodrafts or X-Ray prints. Tolerance plus or minus .005. Expertly band-sawed and filed. Aircraft prime and subcontractors now using our service.

Template & Parts Division

(A War Production Affiliate of Cleveland Shopping News)
5309 Hamilton Avenue Cleveland, Ohio

PASSING PARADE

poration, will make his headquarters at the company's general offices in Brackenridge, Pa., it was recently announced.

Frank C. Ritzel and **Edward C. Himmeler**, veteran employees of Westinghouse Electric Manufacturing Company, recently received the Westinghouse Order of Merit for teaching younger men "tricks of the trade," which helped increase the production of war equipment.

James F. McNamara of International Nickel Company, Inc.; **Stanley M. Tracy**, executive vice president of Driver-Harris Co.; **C. K. Pistell**, chair-

man of the board of Breeze Corporation; **John R. Montgomery**, president of Blair & Co.; **Warren Stratton** of Martineau & Stratton; **F. M. Hoefler**; and **L. W. Johnson** were elected as directors of the Harvill Corporation of Los Angeles at a recent stockholders meeting. Mr. McNamara will be chairman of the board, Mr. Hoefler will be president, Mr. Pistell, executive vice president, and Mr. Johnson, secretary and treasurer.

Albert H. Eggers, vice-president and machine tool sales manager of Greenlee Bros. & Co., of Rockford, Illinois, has been named president of the company

to succeed **George C. Purdy**, who becomes chairman of the board. **Leslie H. Geddes**, assistant sales manager in



ALBERT H. EGERS
New Greenlee president.

charge of screw machine sales, has been named second vice-president of the company. **O. Vincent Haegg** succeeds **Albert E. Alverson** as secretary, Mr. Alverson retiring after 42 years of service.

David Hall, 68, Westinghouse engineer since 1908, retired January 1.

Capt. Nelson W. Pickering, USNR was ordered to report for active duty in the United States Navy February 1. Accordingly, Capt. Pickering has resigned his post as president of Farrell Birmingham Company.

Commander R. E. W. Harrison, U.S.N., vice president of Chambersburg Engineering Company at Chambersburg, Pa., was recalled to active duty February 1st. Commander Harrison returned to his concern July 1942 in temporary inactive duty status.



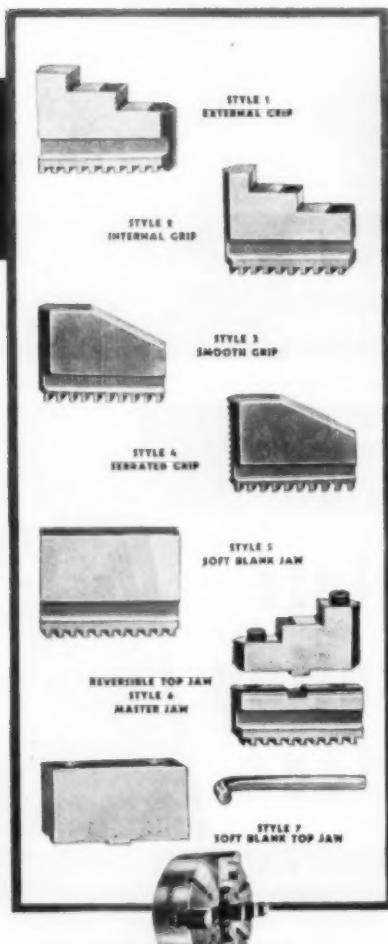
R. E. W. HARRISON
Recalled to active duty.

Dr. Edward L. Mack, formerly of the faculty of Cornell University and for 10 years director of research and development for the Reynolds Metals Company, has been granted two United States patents covering an improved type of fastening device for Aircraft. It has been announced by Aircraft Parts Development Corporation that Dr. Mack and his associates are working in conjunction with this concern to complete the final phases of the engineering, including production tool design for a full line of the new fasteners.

Philip W. Metting, Cooper-Bessemer compressor expert, stationed at the

(Continued on page 220)

THE TOOL ENGINEER



CUSHMAN

A World Standard for PRECISION

These "Chuck Check" cards, giving the 6 most important rules of good chuck practice are available for distribution to your operators. Write us. The Cushman Chuck Company, Hartford, Connecticut.



The "Sterling" mark on reconditioned cutting tools.



We etch it on every piece, and we stand behind it.

NATIONAL TOOL SALVAGE CO.
6511 Epworth Blvd.
Detroit, Michigan
(Note new address)

U S HEADS STANDARD SINCE 1915



30 DIFFERENT STANDARD SIZE
ADJUSTABLE DRILL HEADS,
CAPACITIES UP TO 1½" DRILLS

SEND US YOUR B/PS

All Types of Fixed Center Heads

UNITED STATES DRILL HEAD CO.,
Cincinnati, Ohio

Two of more than 90 Ransome Welding Positioners in this plant

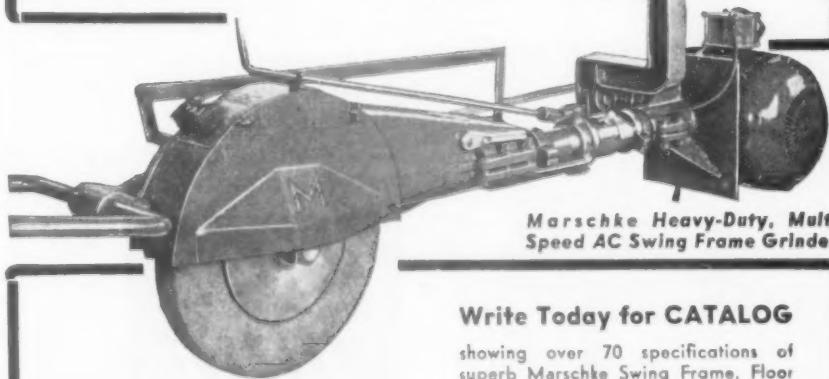
EFFICIENT POSITIONING
means better welding and greater output...
» Write for literature and full details on Ransome Welding Positioners

Ransome WELDING POSITIONERS

INDUSTRIAL DIVISION • RANSOME MACHINERY COMPANY • DUNELLEN, NEW JERSEY

"Dependable Durability" is built into

MARSCHKE SWING FRAME GRINDERS



Marschke Heavy-Duty, Multi-Speed AC Swing Frame Grinder!

THE MARSCHKE LINE

Manufactured and sold by
VONNEGUT MOULDER CORPORATION
1820 Madison Ave., Indianapolis, Ind.

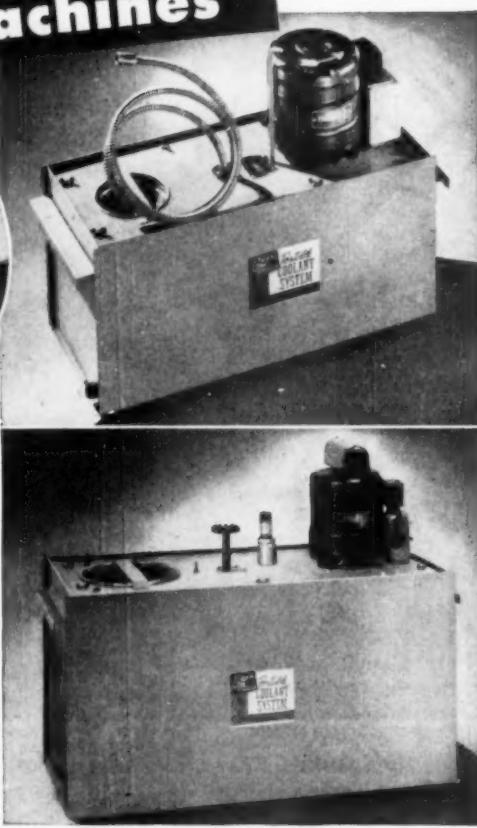
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showing over 70 specifications of superb Marschke Swing Frame, Floor Stand and Pedestal Grinders and Buffers—from 1 to 25 HP. Each built to machine tool standards... showing 18 features of superiority to give long dependable service under toughest, grittiest operating conditions.

For TOP PRODUCTION on all Machines



Above: Standard Model — capacities up to 130 gals. per hour. Above, right: Heavy Duty "A" Series Model — capacities up to 165 gals. per hour. Right: Model H-10A Centrifugal — capacities 10 to 1,000 gals. per hour.



Use COOLANTS Applied with Gray-Mills Portable COOLANT SYSTEMS

PROPER application of coolants in metal working operations means increased production and time-and-tool savings. You can have these advantages for every machine — small, large and special — with Gray-Mills Portable Coolant Systems. They can be installed in a few minutes, are modern in design, and of heavy-duty construction with built-in quality to give trouble-free service.

Use Gray-Mills Portable Coolant Systems to modernize older machines, to equip small, large and special tools for greatest efficiency, and for emergency stand-by service. Pump sizes range from 50 to 1,000

gals. per hour, and pans, valves and fittings are available for your applications. Priced from \$39.50. Call your distributor, write or wire:

GRAY-MILLS COMPANY
235 W. Ontario St. • Chicago, Ill.



Left: Heavy Duty "A" Series Model speeds production of this milling machine.



Right: Heavy Duty "A" Series Model provides controlled coolant flow to this belt grinder.

Complete Portable COOLANT SYSTEMS, FLO-BAC COOLANTS, RETURN PANS and FITTINGS

PASSING PARADE

corporation's Mount Vernon, Ohio plant, has been transferred to the firm's branch office in Los Angeles.

J. H. Richards, Dr. Lock Hale, and O. W. Weyman figured in a recent announcement of the Fray Machine Tool Company of Glendale, California, of its incorporation for \$1,000,000. Mr. Richards will be president and general manager, Dr. Hale will be secretary and treasurer, and Mr. Weyman will be vice president.



J. H. RICHARDS
Fray's president and general manager.

A. F. Dobbrodt was recently appointed Southern district manager for Carboboy Company, Inc. and will make his headquarters in the Comer Building at Birmingham, Alabama.

Murray Ireland has been elected vice president in charge of production for the Toastmaster Products Division at Elgin, Illinois, it was recently announced by the board of directors of McGraw Electric Company.



MURRAY IRELAND
Production head at Toastmaster.

M. C. Morgan, formerly field service engineer, has been appointed assistant Pittsburgh division sales manager of A. M. Byers Company.

Richard Calvert, sales representative in Eastern and Central Pennsylvania for The Carpenter Steel Company has announced his retirement after 30 years of service with the company.

John J. Fiske has been named electronic control specialist for the Westinghouse Electric and Manufacturing Company in the Los Angeles area.

J. A. McDonald was recently appointed district sales engineer in Wayne
(Continued on page 222)

THE TOOL ENGINEER

DIAMONDS for Victory

SPEED PRODUCTION ... IMPROVE FINISH

Centerless Grinding Template Dressing



Only \$10.00 Extra LOC-KEY-SET, RE-SET-ABLE Diamond: Common Quality. Big-Hed Nib to fit \$12.00 per carat. 3 to 4 carat size Re-Set-able recommended.

Enables bullet nose grinders, using centerless grinders with template attachment, to use common quality diamonds to dress form wheels by dressing from 1" to 6" radius with the ANGLE-SET. Mean fixed position of nib prevents wear to setting and eliminates hazardous use of thin diamonds.

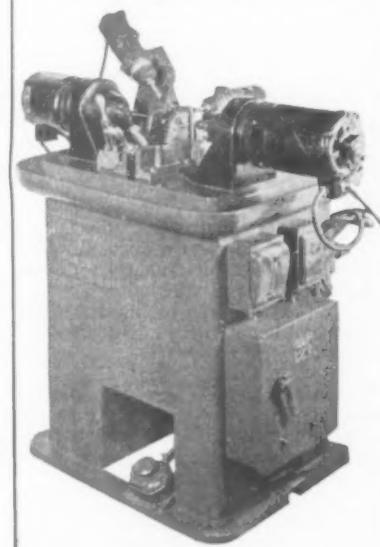
Trade Marks LOC-KEY-SET, RE-SET-ABLE and BIG-HED are guarantees of Dressing Satisfaction. Send specifications and prints for prices on turning and boring form tools.

Sheldon M. Booth, Pres.

Send specifications and prints for prices on turning and boring form tools.

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938 E. 41st Street, CHICAGO, ILL.

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INCORPORATING
GOVRO-NELSON
PROTECTIVE CENTRIFUGAL FEED
DRILLING UNITS

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ENGINEERING SERVICE
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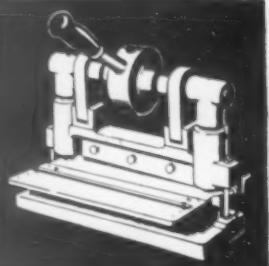
MARCH, 1943

SOLVE YOUR "SHORT RUN" DIE PROBLEMS

with

DI-ACRO

(DIE-A-CR-O) PRECISION MACHINES*



SEND FOR CATALOG

"Metal Duplicating without Dies"

It's an eye-opener on what you can do without dies, shows typical parts, and gives sizes and capacities of all models of Di-Acro Shears, Brakes, Benders.



O'NEIL-IRWIN MFG. CO.

307 8th Avenue So.,
Minneapolis, Minn.

"Extra Special Rush! Speed it up! When can you deliver?" Maybe you don't have to wait — Wait — WAIT — for dies! Try "DIE-LESS DUPLICATING" with Di-Acro Shears, Brakes, Benders. These are *precision* machines — all duplicated work is accurate to .001". You'll get a new slant on "short-run" production problems from the great variety of parts which can be produced by Di-Acro Machines. Thousands of them are in use saving Man Hours and Critical Materials.

BENDERS

Di-Acro Bender bends angle, channel, rod, tubing, wire, moulding, strip stock, etc. Capacity — Bender No. 1 — 1", round cold rolled steel bar. Bender No. 2 — 1½" cold rolled steel bar.

BRAKES

Di-Acro Brake forms non-stock angles, channels or "Vees". Right or left hand operation. Folding width — Brake No. 1 — 6". Brake No. 2 — 12". Brake No. 3 — 18".

SHEARS

(Illustrated)
Di-Acro Shear squares and sizes material, cuts strips, makes slits or notches, trims duplicated stampings. Shearing width — Shear No. 1 — 6". Shear No. 2 — 9". Shear No. 3 — 12".

Popular Sizes Are Now Available For IMMEDIATE DELIVERY

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STANDARD
ADJUSTABLE
LIMIT



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Complete Range of Models and Sizes Attractively Priced

SATISFACTION GUARANTEED

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Noble & Vermont Sts., Indianapolis, Indiana

Lincoln 1988 — Lincoln 1966



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Pat. Off.

More production per worker!



Foot Control Leaves Both Hands Free To Work!

WANT more production? Follow the example of leading war plants — put *Speedy Air Vises* to work! This foot-controlled, pneumatic vise leaves operator's both hands free for safe, fast insertion and removal of work. You'll find it cuts time, labor and costs, reduces fatigue. Sturdy, compact, precision-built . . . so low in price it can be economically used on every drillpress, miller, filer and assembly line. Prompt delivery. Ask your distributor or write for details.

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SPEEDY AIR VISE
complete with Foot Control \$24
Valve, Air Hose and Fittings . . .

W. R. BROWN CORP.
5722 ARMITAGE AVE., CHICAGO, ILL.

AMERICA'S MOST TALKED-ABOUT VISE . . . AT A PRICE!

PASSING PARADE

County, Michigan for the Illinois Tool Works.

Oscar Theander, long associated with the automobile industry, this month was appointed plant superintendent for the Detroit Universal Duplicator Co. Before accepting his new position, Mr. Theander, who is a member of the A.S.T.E., was assistant chief die designer at Midland Steel Products, Detroit.

H. A. Folgner will be in charge of the new Los Angeles office recently announced by Handy & Harmon of New York. Mr. Folgner has been connected with company's Brazing Engineering Division for many years.

J. P. Enright and Robert W. Crawford figured in recent appointments made by Norton Company of Worcester, Mass. Mr. Enright will be the company's abrasive engineer for Indianapolis and vicinity while Mr. Crawford has been appointed an abrasive engineer in the Pittsburgh territory.



FREDERICK R. CROSS
Now with Aro Equipment

Frederick R. Cross has been appointed general manager in charge of all phases of the Lubricating Equipment Division of The Aro Equipment Corporation of Bryan, Ohio. Mr. Cross previously was sales manager of The Alemite Division of Stewart-Warner Corporation.

DIED

C. G. Gilbert, manager of the Detroit office of the Federal Products Corporation, died in Detroit recently following a heart attack and short illness. Sixty years old at the time of his death, Mr. Gilbert had been with Federal Products Corporation for 22 years.

Mason Hulett of Farrel-Birmingham Company, Inc., died suddenly February 7 in Washington, D. C. Mr. Hulett was on leave of absence and with the WPA at the time of his death.

C. S. Cox, tool designer of the S. F. Bowser Company of Toronto, died recently. Mr. Cox was 38 years old at the time of his death and was a member of the Toronto Chapter of the American Society of Tool Engineers. Prior to his last position, he was chief equipment engineer of the National Steel Corporation at Melton. Well known in mechanical circles in Toronto, Mr. Cox had spent some time in South America and other parts of the world for English interests.

THE END

T. H. L. FRONT LEVER BENCH PUNCH



Built for hard tough work — die cannot lose alignment with punch — all parts interchangeable.

Capacity $\frac{1}{2}$ " holes through $\frac{1}{8}$ " steel; $\frac{1}{16}$ " through $\frac{1}{4}$ " steel. Can also be made for holes up to $\frac{1}{8}$ " in thinner metal. Stock punches and dies available from $\frac{1}{16}$ " to $\frac{1}{2}$ " by 64ths.

Weight, 70 lbs.

**T. H. LEWTHWAITE
MACHINE CO.**

(Est. 1890)

307 E. 47 St.

NEW YORK

NEW MEAD "AIR-CLAMP"



For Greater Drill-Press Output

Whenever a drill comes down, something must hold the work. Wherever a drilling-jig is required Air-Clamp will simplify it. Wherever speed is desired, Air-Clamp will produce it. Air-Clamp holds with relentless pressure; is undisturbed by size variations (such as in castings), it scoffs at vibration (how many drills have been broken due to faulty hold downs?), chatter, snagging. Air-Clamp holds work of any size or shape in any position, at any angle. It can pay for itself on a single fixture; it can save its cost on a few days' drill-press output. Reduces operator-fatigue. Saves hours and dollars in drafting room, jig department, tool room and production line. Air-Clamp fits only drill-press having a cylindrical column. Special fixtures for Tee-slotted tables, light milling work, etc. Hand and/or foot control. Shipped on approval to responsible concerns.



Foot Air Control READY!

For air-operated

devices. Free hands; speeds work.
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MARCH, 1943



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TOOL & DIE MAKERS
SHEET METAL MEN
PATTERN MAKERS
MACHINISTS, ETC.

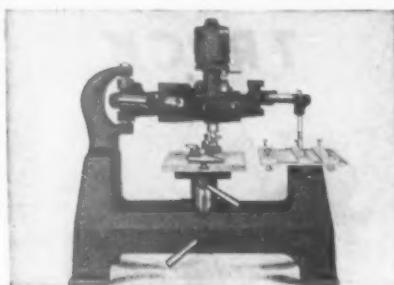
Speeds layout time on brass, aluminum, copper, tin, stainless steel. Won't chip, crack, or flake off. Comes in handy 8 oz. bench type brush-in cans. Also pts., qts., gels.

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. . . three machines in one

A compact precision bench-type pantograph machine, with interchangeable heads . . . for engraving instrument dials, name plates, etc. . . . and for acid etching or electrically marking tools and parts—heat-treated or annealed—on flat, concave, or convex surfaces.

Illustration shows machine with engraving head attached.

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Cleveland, 2 & 2 $\frac{1}{2}$ " Model B
Cleveland, 7 $\frac{1}{2}$ & 2 $\frac{1}{2}$ " Model M
Cone, 2 $\frac{1}{2}$ " 4 spds, M.D.
Gridley, 1 $\frac{1}{4}$ & 2 $\frac{1}{2}$ " Model F
Gridley, 5.5-2 $\frac{1}{4}$, 3 $\frac{1}{4}$ and 4 $\frac{1}{4}$ "
Nos. 22, 23 & 24 New Britain

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No. 6, 15, & 18 Bryant Internal
14 x 36" Norton Plain, M.D.
2" x 6" Van Norman Piston
Lapper, 26" Bethel-Player

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Sundstrand Stub, 8" M.D.
J & L 3" x 36" Dble Spindle

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Bedford 39" x 13"—1 Rail & 1 Side Head
Patch 36" x 13"—1 Rail & Side Head

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POWER PRESSES

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• MACHINE DESIGN & BUILD

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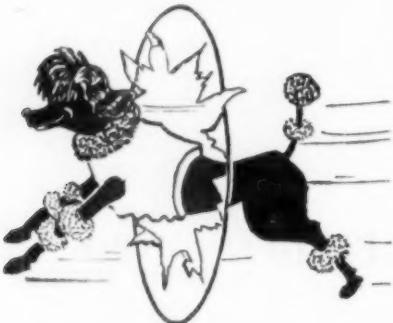
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For positive, efficient, and economical dust control—**Torit does the trick.** Torit Dust Collectors are a portable, self-contained unit, designed for simple installation to grinding, buffing and cutoff machines.

War production demands mean rapid expansion in our factories. Torit Dust Collectors are ideal, as they may be used as auxiliary equipment to large central dust collecting systems already in operation.

Write today for bulletin giving Torit features, specifications, prices, or give us your "dust problem" and let us recommend a solution, without obligation.



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Dust Collectors
SELF-CONTAINED UNITS

MARCH MEETINGS

HAMILTON — March 12, 7:00 P. M. Royal Connaught Hotel, Hamilton. Speaker will be Mr. O. W. Winter, national president of the American Society of Tool Engineers.

MILWAUKEE — March 11, Red Arrow Club, 774 North Broadway. Speaker will be Mr. L. T. Weller, research engineer of the General Electric Company. His subject, "The Action of Cutting Tools."

MINNEAPOLIS — March 17, Covered Wagon Cafe. Technical session speaker will be Mr. John Harrington of the Savage Tool Company. Subject: "Manufacture of Precision Gage Blocks."

ROCKFORD — March 13. Annual St. Patrick's all-engineers' dance at the Faust hotel. Speaker at the April meeting, April 1, will be Maj. Alexander de Seversky.

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2842 W. Grand Blvd. Detroit, Mich.

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WANTED

Experienced foreman for a Tool, Cutter and Gage Shop. Box 759, THE TOOL ENGINEER.

SALES ENGINEERS, as representatives for old established company manufacturing a line of heat-treating furnaces and small tools. Need men with sufficient experience to assist customers on service and engineering problems. Box 764, THE TOOL ENGINEER.

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for Chicago District to represent manufacturer of Tungsten Carbide Tools, Dies and Wear-Resistant Parts not now represented in Chicago. Salary and Commission. Good opportunity with substantial income for aggressive salesman. Give age, past experience, references and other qualifications. Write Box 765, THE TOOL ENGINEER.

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Industrial Engineer, Graduate, 14 years Engineering, Processing, Timestudy, Production, Supervision, and War Training Class Organization experience. Formerly Chief Engineer and Superintendent of small plant. Age 40. Eligible under W.M.P.C.E.S. Desires position with organization with post war program. Box 767, THE TOOL ENGINEER.

Master Mechanic or Tool Engineer. By married man 48 years old, with engineering education and 25 years of practical experience in machinery and tools. Box 766, THE TOOL ENGINEER.

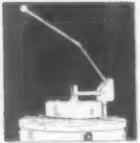
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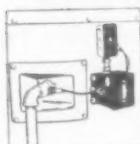
When days mean VICTORY call for Johnson FURNACES

2 WEEKS DELIVERY

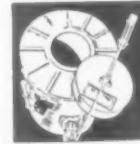
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Pot Hardening
and Melting Furnace



Lid lifting mechanism easily raises cover. Locks in UP position.



Electric Ignition facilitates lighting burrs. May be used with photo-electric safety system, for complete protection from possible explosions due to gas failure.



Heavily Insulated
—1 1/2" firebrick
backed up with
3 1/2" insulating
brick.

THE burners in Johnson 575 are located near top of combustion chamber to insure longer pot life. Vent damper regulates flow of exhaust gases, and may easily be connected to duct to remove gases from building. Semi-concealed piping gives better appearance and keeps pipes out of operators way. Top ring, in 3 sections, prevents cracking or distortion. Large blower assures maximum performance. \$315.00 F.O.B. Factory. (Blower Extra).

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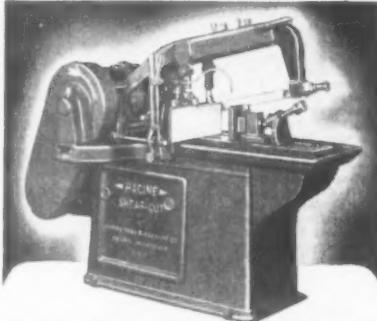
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Racine Metal Cutting Machines are hydraulically fed and controlled for smooth "oil-cushioned" operation.

Racine offers a complete range of cutting pressures in either "positive progressive" feed, or in "self-compensating progressive" feed. Progressive feeding produces a true and natural shearing stroke. Saves blades and permits faster cutting.

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A Modern Source of Hydraulic Force
For bending, feeding, molding, holding, pressing and numerous other operations. Pressures of 50 to 1000 lbs. per sq. in. at 0 to 30 gal. per min. HYDRAULIC VALVES—Sizes $\frac{3}{8}$ " to $1\frac{1}{2}$ ", with mechanical, electrical or manual operating devices. Request complete information and prices. Address Dept. TE-S.

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MARCH, 1943

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The ONLY Boring Bar with the economical triangular bit.

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Everede Boring Bars are made of the finest heat treated nickel steel and each bar is furnished with six triangular high speed steel bits.

The Everede Boring Bar also permits the use of a solid stellite or carbide tool bit by clamping the bit in the "V" Type grip holding it firmly without danger of breakage.

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HIGH SPEED TAPS

NOW ON CRITICAL LIST.
KEEP THOSE NOW IN SERVICE 100% EFFICIENT BY
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THIS NO. 12 GRAND RAPIDS
TAP GRINDER MAKES THE
JOB A SIMPLE ONE.

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Grob files are accurate, quality files that remove more stock and cut faster. Get the best—GROB die cutting machines and files.

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BUILT TO SAVE TIME

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Johnson Gas Appliance Co.	224		
Jones & Lamson Machine Co.	35		

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1.

Automatic Rivet Hopper. This automatically positions the rivet for entrance into the gravity fed rivet storage raceway.

2.

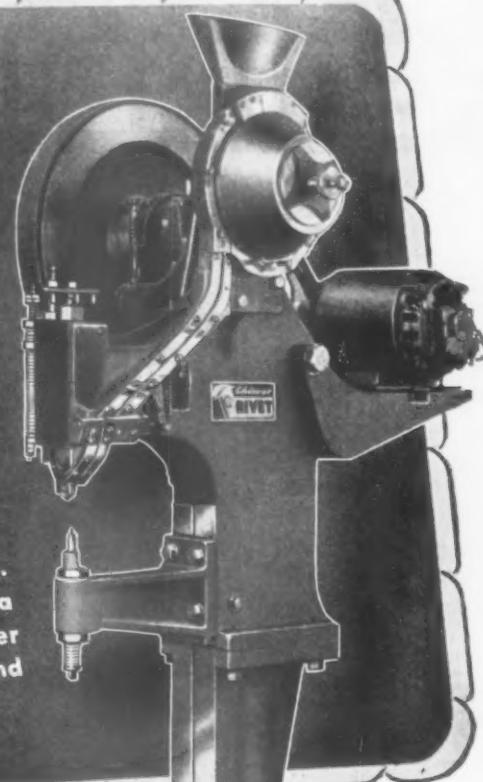
Automatic Rivet Transfer. Synchronized with the pedal release, a single rivet is transferred from the storage raceway to the feeding raceway. The rivet slides by gravity directly under riveting hammer.

3.

Automatic Locating Pilot. This aids operator in positioning assembly for insertion of rivet.

4.

Automatic Rivet Insertion and Clinching. Operation of Pedal control results in a single movement of riveting hammer which inserts rivet in the assembly and produces clinch.



There is a difference in riveting machines and that difference invariably is Chicago Rivet. Embodying advanced features of design, it is becoming more and more the choice of production engineers on all products in which tubular, split and solid aircraft rivets are used.

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For 9/64" steel tubular or 3/16" brass tubular rivets. May be used for 3/32" solid aircraft type rivets with stripper type anvil, not shown.

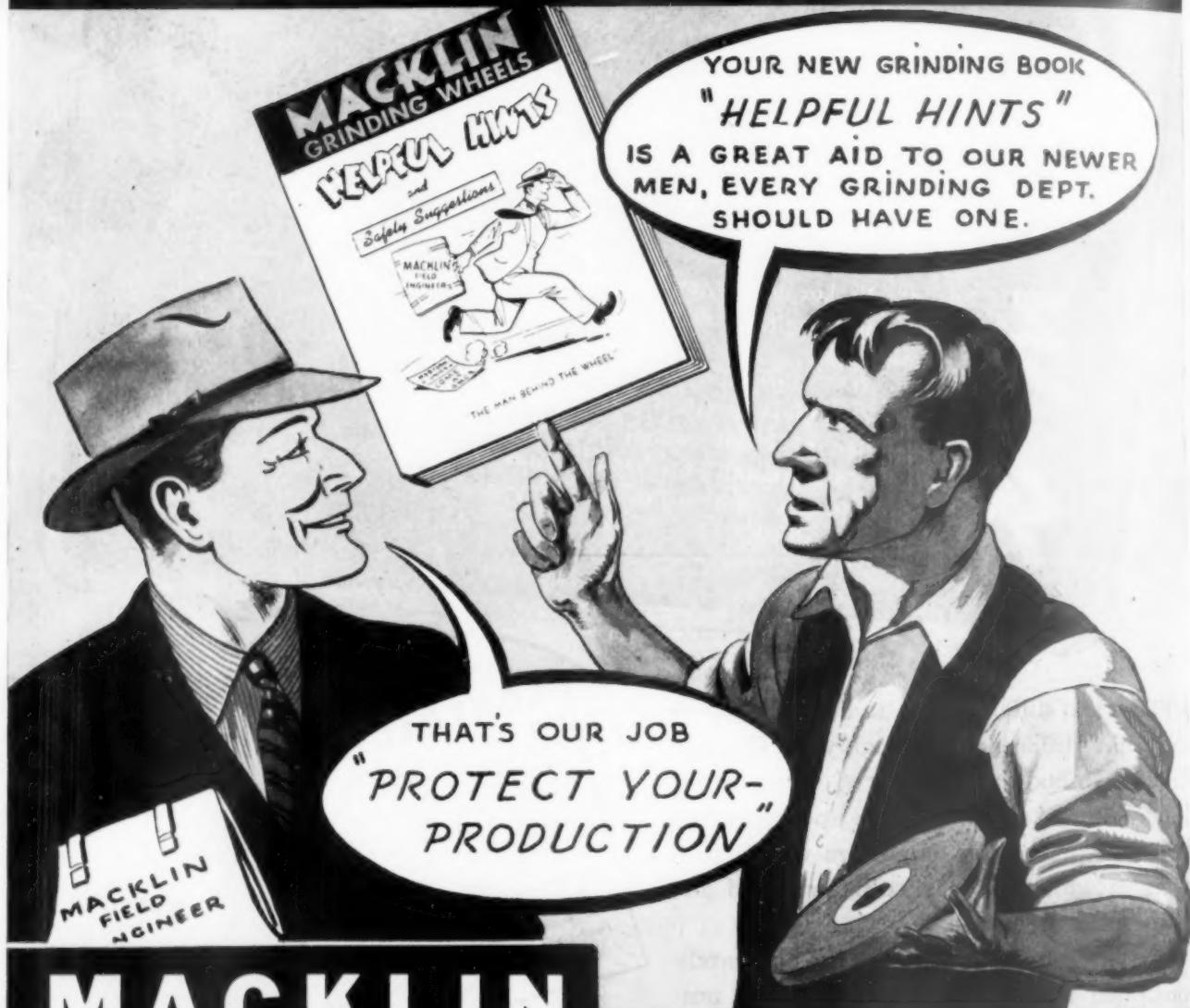
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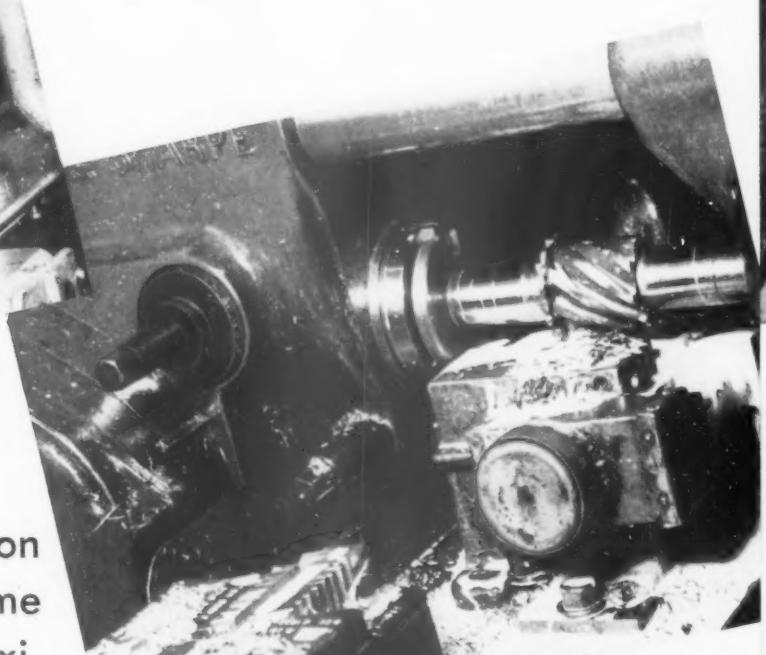
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One machine and **one** set of cutters often can do the work of **two**



CLIMB



CONVENTIONAL

DOUBLE FIXTURE MILLING

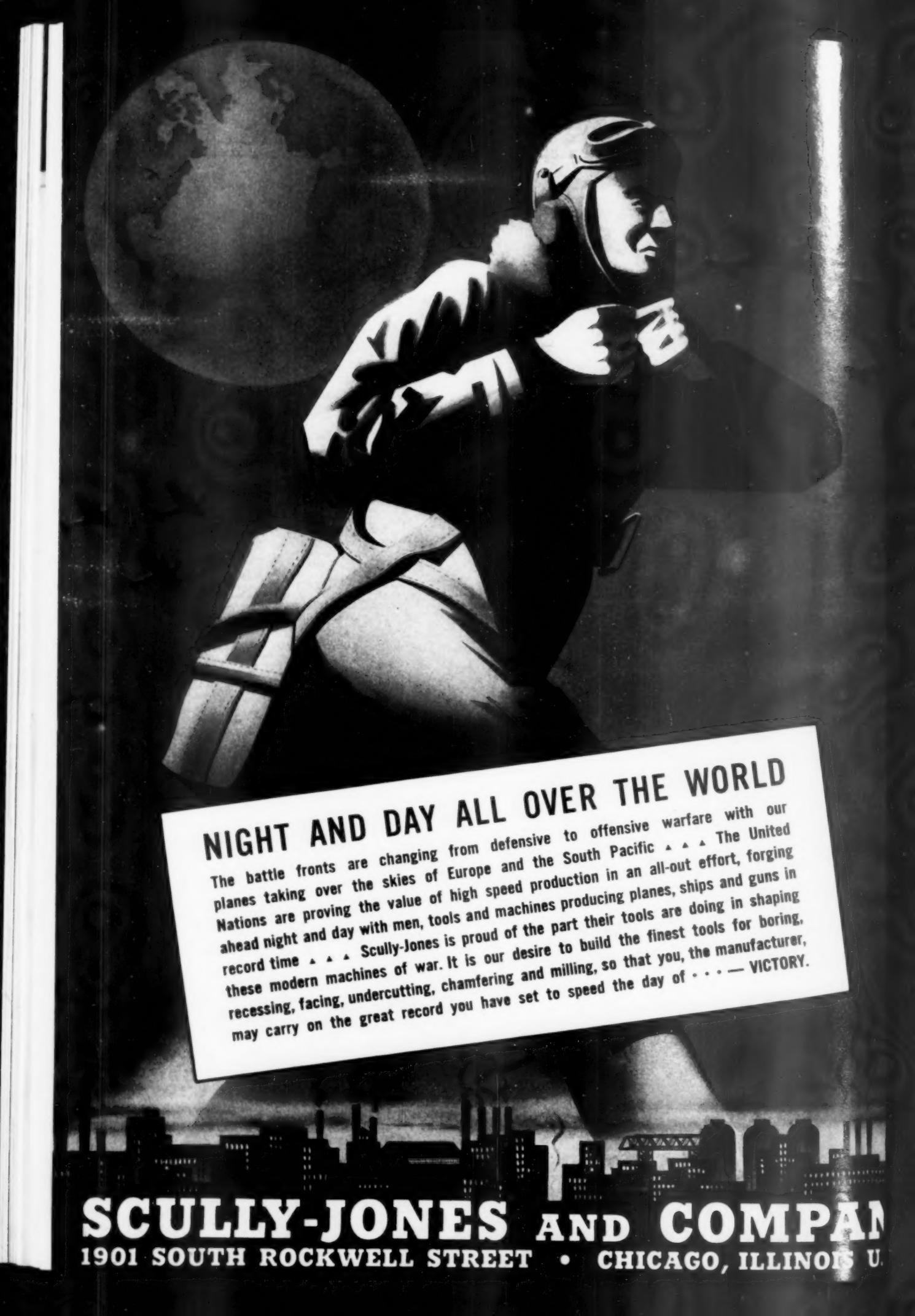
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on New № 12's**

KEEP MACHINES PRODUCING

- Keep them clean
- Lubricate regularly with proper oils
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- A little consideration on your part will prevent unnecessary wear, breakdowns and repairs



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